

FREE FULL-SIZE PLAN INSIDE

MODEL AIRPLANE NEWS

January 1993

ISSN 48120

Canada \$3.75



• **HOW TO
SCARF JOINTS**

• **BALSA USA
1/3-SCALE CUB**

• **WORLD SCALE CHAMPS**

• **EASY FIBERGLASS PARTS**



Hobbico / Model Airplane Sweeps—Over \$3,500 in Prizes

MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

FEATURES

- 18 Engine Review:**
O.S. FT-160
by Mike Billinton
—Scale-like,
smooth and
powerful

- 28 1992 FAI Scale Championships**
by John E. Jundt
—World meet
in Muncie

- 37 Balsa USA
1/3-Scale Cub**
by Gerry Yarrish
Field & Bench
Review
—Fighting
Piper L-4

- 44 Wing Design,
Part 1**
by Andy Lennon
—A look at
the fundamentals

- 53 Ace R/C
Easy Eagle**
by David D.
Garwood
Field & Bench
Review
—Something
new in 2M
sailplanes

- 62 1992 NCCFA
Competition Fun
Fly Nats**
by Tom Atwood
—The fastest
aerobatics ever

- 66 How To Make
Scarf Joints**
by Clarke Smiley
—Scrap-bin bonus



ABOVE: Peter McDermott of England campaigned this magnificent 1/4-scale, 1916 Sopwith Triplane at the 1992 FAI World Championships. Peter placed 1st in static, 2nd in flying and 1st overall. (Photo by John Jundt.)

ON THE COVER: first published in April 1930, this cover by Jean Oldham takes us back to a time when far more kids were involved in aeromodeling. Much could be done to bring more youngsters back into the fold (see "Editorial").

FEATURES

- 68 How To Make
Fiberglass Parts**
by Jerry Nelson
—Using a vacuum
to help mold
fiberglass parts

- 81 Global Skylane
.45 to .61**
by George
Jenkins
Field & Bench
Review
—A strong, rugged
sport trainer

HELICOPTER

- 93 Kalt Baron Alpha II**
by John Bona
—Agility with
.60-size stability

- 98 Rotary-Wing
Roundup**
—New products
for the heli
enthusiast

CONSTRUCTION

- 71 Extra 3.25**
by Rich Uravitch
—A little Extra
for aerobatics

COLUMNS

- 11 Air Scoop**
by Chris Chianelli
—"I spy for
those who fly"

- 15 How To: Make a
Broomstick
Fuselage Stand**
by Randy
Randolph

- 49 Video Views**
by Jef Raskin
—Top Gun '92
and Those
Incredible
Gee Bees

COLUMNS

- 86 Simple
Programming**
by David C. Baron
—Fun-fly mixing
with the X-347

- 100 Center on Lift**
by Michael
Lachowski
—Stands, carbon
fiber and golf?

- 108 Sporty Scale
Techniques**
by Frank Tiano

- 112 Golden Age of
Radio Control**
by Hal deBolt

- 128 Engines Aloft**
by Bob Gilbert
—O.S. 40FP

DEPARTMENTS

- 6 Editorial**
8 Airwaves
16 Hints and Kinks
24 Pilot Projects
106 Product News
115 Buyers' Guide
125 Club of the Month
126 Name That Plane
134 Classifieds
138 Ad Index

EDITORIAL

T O M A T W O O D

SHARE THE WEALTH

THIS ISSUE'S cover, which we first published in April 1930, is emblematic of the heavy involvement of youngsters in modeling at a time when aviation was still early in its development. Some say that because jet airliners are now commonplace, many kids



Above: Editor-in-Chief Tom Atwood (left) explains stick technique to an eager R/C pilot-to-be while columnist David Baron (right) helps translate theory into practice. The Brookfield, CT, Cub Scouts (Pack 135) and their families enjoyed this opportunity, courtesy of the F.L.Y.R.C. Club of Danbury, CT. Right: David Baron gives the kids of Good Friend—a Big Brothers/Sisters-type of organization—some time on the sticks flying a double-size Nifty Fifty (100-inch wingspan). The field was provided by F.L.Y.R.C. On the way home, the kids could not stop talking about the experience.



prices should go down. Modelers love to argue, and I can imagine what many readers are thinking. If a serious effort were made to bring youngsters into the hobby, how many could afford it? The minimum budget for entry into the hobby—somewhere around \$300, assuming used equipment, a small engine, etc., and a good deal less if you start with a scratch-built glider—can be compared quite favorably with the price of many of the popular video games (particularly given the cost of additional game cartridges). In R/C, of course, the video screen extends well into the sky.

There are a huge number of kids who would like to get into the hobby, but who is going to introduce them? Can the modeling clubs make a difference? A statistic that Frank Garcher, president of Midwest Products Co., pointed out

lingers in the back of my mind. If the 2,600 R/C clubs in this country each held a one-year program in which they put on an exhibition for 10 schools, and if each school brought 50 students, then $2,600 \times 10 \times 50 = 1,300,000$ students would be given a chance to at least witness R/C flight. If three schools were involved at each of three meetings, it would be a quarterly program for a given club. Suppose

each club made one such effort in a year—the number of kids reached would still be several hundred thousand.

A WORTHY EXAMPLE

It's all well and good to urge modelers to action, but many would be more interested in a specific example of how it can be done. At the Madera Races I had the pleasure of meeting Charles Kelley, who has been instrumental in developing an R/C class that, now in its second year, involves five high schools and nearly 100 students. Last year, the program involved two schools and about 25 students (six of whom reportedly have become

AMA members). This program is supported by two forward-thinking clubs—the Compton Tail Spinners and the Anaheim Model Airplane Club. The class is held three Saturdays each month for the entire school year and includes three basic subjects: aerodynamics, aeronautical engineering and how to fly an R/C aircraft.

The program came into being almost by accident. Prentice Ellis was a principal at a junior high school where the Compton Club had secured rights to fly. The club made a point to introduce interested students to aeromodeling on weekends, and an informal educational program began to take shape. When Mr. Ellis moved to the Savanna High School, he asked Charles if the Compton Tail Spinners wanted to continue the program on the high-school level. They did, and the school board approved a trial program. After the first year, the program was made official, and now students receive credit for participation.

The program has received added support from local aerospace companies and several hobby manufacturers. Rockwell International and McDonnell Douglas have agreed to provide tours as part of the program, and Rockwell is planning to offer support for some of the classes, e.g., on lift capabilities of airfoils. Hobby names involved in this program include Larry Wolfe of Jet Hangar, Joe Bridi of Bridi Aircraft Designs and John Eaton of JK Products. Other supporters include Futaba, Airtronics and Carl Goldberg Models.

At the end of the school year, aircraft built by the kids compete in a Top-Gun-style flying competition. (Last year, the competition revolved around a K&B .45-size trainer design.) Charles Kelley said, "This year we have five schools and two modeling clubs involved, and next year we hope to have 10 schools and four modeling clubs." Charles invites interested parties who may wish to put on similar programs to contact him at 151 West Scott St., Long Beach, CA 90805; phone—(310) 635-8231. We at *Model Airplane News* applaud Charles's efforts, and those of the supporting companies, schools and modeling clubs. We will keep you posted about developments in this area. If you have a success story along these lines, write to me and let me know. ■

accept airplanes as a given and aren't disposed to take an interest in aeromodeling. In my opinion, this is an easy excuse for those who feel they don't have the time to concern themselves (and if they don't have time, so be it), or who just don't care. But we should care.

Two facts: (1) youngsters get a tremendous kick out of flying R/C airplanes (I can attest that the kids shown in the photos, who are typical, had a memorable time), and (2) manufacturers would benefit from an infusion of young modelers into the hobby. The more modelers, the more products that will be manufactured, and as volume goes up,

MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

Group Publisher LOUIS V. DeFRANCESCO JR.

Publisher DR. LOUIS V. DeFRANCESCO

Associate Publisher YVONNE M. DeFRANCESCO

Editor-in-Chief TOM ATWOOD

Senior Editor CHRIS CHIANELLI

Associate Editor GERRY YARRISH

Editorial Assistant JULIE SORIANO

Copy Director LYNNE SEWELL

Copy Editors KATHERINE TOLLIVER
DEBORAH S. CARROLL
KAREN JEFFCOAT
DIANA L. WINARSKI

Corporate Art Director ALAN J. PALERMO

Associate Art Director MARY LOU RAMOS

Assistant Art Directors BETTY K. NERO
MATTHEW J. LONGLEY

Art Assistant STEPHANIE L. WARZECHA
ALLYSON NICKOWITZ

Promotional Artist ROBIN DEMOUGEOT

Staff Photographers WALTER SIDAS
LISA KNORRA

Systems Manager EDWARD P. SCHENK

Systems Coordinator JEFF WASILKO

Director of Marketing GARY DOLZALL

Circulation Manager KATHLEEN RHODES

Marketing Manager PAULINE A. GERRY

Circulation Assistant KYRA DUHAIME

Production Manager MARY REID McELWEE

Advertising Account Representative (East) KURT G. SWENSON

Advertising Account Representative (Midwest) MICHAEL S. STANKIEWICZ

Advertising Account Representative (West) SHARON WARNER

Advertising Traffic Coordinator ELISE SILKOWSKI

SUBSCRIPTION PRICES: U.S. & Possessions (including APO & FPO): 1 year (12 issues), \$27.95; 2 years (24 issues), \$49.95. Outside U.S.: 1 year, \$37.95; 2 years, \$69.95. Payment must be in U.S. funds.

SUBSCRIPTION INQUIRIES: call 1-800-827-0323.

MODEL AIRPLANE NEWS (ISSN No. 0026-7295) is published monthly by Air Age, Inc., 251 Danbury Rd., Wilton, CT 06897. Connecticut. Editorial and Business Offices, 251 Danbury Rd., Wilton, CT 06897. Phone: 203-834-2900. FAX: 203-762-9803. Y.P. Johnson, President; G.E. DeFrancesco, Vice President; L.V. DeFrancesco, Secretary; Yvonne M. DeFrancesco, Treasurer. Second Class Postage Permit paid at Wilton, Connecticut, and additional mailing offices. Copyright 1992 by Air Age, Inc. All rights reserved.

CONTRIBUTIONS: To authors, photographers, and people featured in this magazine, all materials published in *Model Airplane News* become the exclusive property of Air Age, Inc., unless prior arrangement is made in writing with the Publisher. The Publisher assumes no responsibility for unsolicited material. Only manuscripts and supporting material accompanied by an SASE will be returned.

ADVERTISING: Advertising rates available on request. Please send advertising materials, insertion orders, etc., to *Model Airplane News*, Advertising Dept., Air Age, Inc., 251 Danbury Rd., Wilton, CT 06897. Phone: (203) 834-2900. FAX: (203) 762-9803.

CHANGE OF ADDRESS: To make sure you don't miss any issues, send your new address to *Model Airplane News*, Subscription Dept., P.O. Box 428, Mount Morris, IL 61054, six weeks before you move. Please include the address label from a recent issue, or print the information exactly as shown on the label. The Post Office will not forward copies unless you provide extra postage. Duplicate issues cannot be sent.

POSTMASTER: Please send Form 3579 to *Model Airplane News*, P.O. Box 428, Mount Morris, IL 61054.

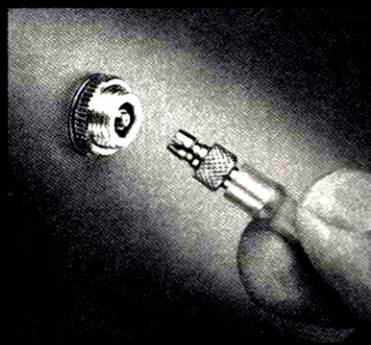
ABC MEMBERSHIP APPLIED FOR

KWIK-FILL FUELING VALVE

We've Made Some Great Connections.



DU-BRO's Kwik-Fill Fueling Valve not only provides a clean and simple installation, it also is a safe and convenient way to fill your tank without disconnecting your fuel line from the carburetor. Other features include an automatic shut off of fuel to the carburetor while refueling and an overall streamline look once installed.



For a Free Catalog send \$1 for shipping & handling:

DU-BRO

DU-BRO Products • P.O. Box 815 • Wauconda, IL 60084

NI-CAD CYCLERS FINALLY BECOME AFFORDABLE

At last, affordable Ni-Cad cyclers/chargers. Designed and developed by RC'ers for RC'ers, the AD Series from Double M Electronics is a highly reliable, accurate, and easy to use means for cycling Ni-Cad batteries. The AD Series will handle any Ni-Cad or Ni-Cad pack up to 9.6 Volts and up to 2000 mAh (for specifications outside this range, there is the ADX Series). Models are available with one and two channels and with up to three selectable battery voltage/mAh ratings per channel. You specify the battery ratings when ordering. All of the AD Series models can also function as dedicated chargers.

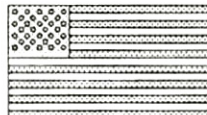
For more information, send us your name, address, and the types of Ni-Cads that you use and we'll be glad to send you our complete information package absolutely free.

AD Series priced from \$69.95 to \$129.95

DOUBLE M ELECTRONICS

P.O. Box 159 • Glenn Dale, Maryland • 20769

AD Series Patent Pending



Designed and Manufactured in America.

TNR YOUR BATTERY STORE

279 Douglas Avenue
Altamonte Springs, FL 32714

NEED BATTERIES?

SANYO - Simply The Best

| STANDARD CHARGE | V | mAh | DIMENSIONS | Price |
|----------------------|-----|------|-------------|-------|
| | | | D" H" | |
| N-50AAA | 1.2 | 50 | .394 0.591 | 2.00 |
| N-200AAA | 1.2 | 200 | .394 1.720 | 1.50 |
| N-150N | 1.2 | 150 | .453 1.122 | 1.50 |
| N-110AA | 1.2 | 110 | .551 0.950 | 1.50 |
| N-270AA | 1.2 | 270 | .551 1.161 | 2.50 |
| N-600AA | 1.2 | 600 | .543 1.945 | 1.50 |
| N-500A | 1.2 | 500 | .650 1.094 | 1.50 |
| N-650SC | 1.2 | 650 | .866 1.016 | 3.00 |
| N-1100C | 1.2 | 1100 | .992 1.173 | 3.00 |
| SR SERIES | | | | |
| KR-1300SC | 1.2 | 1300 | .866 1.654 | 2.50 |
| KR-2000C | 1.2 | 2000 | .992 1.929 | 4.00 |
| KR-4400D | 1.2 | 4400 | 1.272 2.362 | 7.00 |
| KR-7000F | 1.2 | 7000 | 1.272 3.543 | 15.00 |
| HIGH CAPACITY | | | | |
| N-750AAE | 1.2 | 750 | .543 1.945 | 2.00 |
| N-225AE | 1.2 | 225 | .650 .642 | 2.50 |
| KR-600AE | 1.2 | 600 | .650 1.094 | 2.50 |
| KR-1000AE(L) | 1.2 | 1000 | .650 1.654 | 3.00 |
| KR-1200AE | 1.2 | 1200 | .650 1.909 | 3.00 |
| KR-1700SCE | 1.2 | 1700 | .866 1.654 | 3.75 |
| KR-2400CE | 1.2 | 2400 | .992 1.929 | 4.50 |
| KR-5000DE | 1.2 | 5000 | 1.272 2.362 | 10.00 |
| FAST CHARGE | | | | |
| N-800AR | 1.2 | 800 | .642 1.909 | 3.00 |
| N-600SCR | 1.2 | 600 | .866 1.016 | 3.25 |
| N-1000SCR | 1.2 | 900 | .866 1.299 | 3.50 |
| N-1400SCR | 1.2 | 1400 | .866 1.654 | 3.50 |
| N-1500SCR | 1.2 | 1500 | .866 1.929 | 4.50 |
| N-1100CR | 1.2 | 1100 | .992 1.173 | 4.25 |
| N-1800CR | 1.2 | 1800 | .992 1.929 | 6.50 |
| N-4000DR | 1.2 | 4000 | 1.272 2.362 | 10.00 |

- Specify Solder Tabs FREE OF Charge -

RECEIVER PACKS

| | | | | |
|-------------|-----|------|-------------|-------|
| 4N-50AAA | 4.8 | 50 | FLAT | 8.95 |
| 4N-150N | 4.8 | 150 | FLAT/SQUARE | 8.95 |
| 4N-200AAA | 4.8 | 200 | FLAT/SQUARE | 8.95 |
| 4N-110AA | 4.8 | 110 | FLAT/SQUARE | 8.95 |
| 4N-225AE | 4.8 | 225 | FLAT/SQUARE | 10.95 |
| 4N-270AA | 4.8 | 270 | FLAT/SQUARE | 8.95 |
| 4N-600AA | 4.8 | 600 | FLAT/SQUARE | 8.95 |
| 4N-750-AAE | 4.8 | 750 | FLAT/SQUARE | 10.95 |
| 4N-500A | 4.8 | 500 | FLAT | 9.95 |
| 4N-600AE | 4.8 | 600 | FLAT | 10.95 |
| 4N-800AR | 4.8 | 800 | FLAT/SQUARE | 12.00 |
| 4KR-1000AE | 4.8 | 1000 | FLAT/SQUARE | 15.00 |
| 4KR-1200AE | 4.8 | 1200 | FLAT/SQUARE | 16.00 |
| 4N-650SC | 4.8 | 650 | SQUARE | 14.00 |
| 4N-1000SCR | 4.8 | 1000 | FLAT/SQUARE | 16.00 |
| 4KR-1300SC | 4.8 | 1300 | FLAT/SQUARE | 12.00 |
| 4KR-1400SCR | 4.8 | 1400 | FLAT/SQUARE | 16.00 |
| 4KR-1700SCE | 4.8 | 1700 | FLAT/SQUARE | 22.00 |
| 4KR-2000C | 4.8 | 2000 | FLAT/SQUARE | 20.00 |
| 4KR-2400CE | 4.8 | 2400 | FLAT/SQUARE | 22.00 |
| 4KR-2800CE | 4.8 | 2800 | FLAT/SQUARE | 26.00 |
| 4KR-4400D | 4.8 | 4400 | FLAT/SQUARE | 34.00 |
| 4KR-5000DE | 4.8 | 5000 | FLAT/SQUARE | 42.00 |
| 5N-50AAA | 6.0 | 50 | FLAT | 12.00 |
| 5N-150N | 6.0 | 150 | FLAT | 12.00 |
| 5N-110AA | 6.0 | 110 | FLAT | 12.00 |
| 5N-270AA | 6.0 | 270 | FLAT | 12.00 |
| 5N-600AA | 6.0 | 600 | FLAT | 10.00 |
| 5N-750AAE | 6.0 | 750 | FLAT | 12.50 |
| 5N-500A | 6.0 | 500 | FLAT | 12.50 |
| 5N-600AE | 6.0 | 600 | FLAT | 15.00 |
| 5N-800AR | 6.0 | 800 | FLAT | 15.00 |
| 5KR-1200AE | 6.0 | 1200 | FLAT | 19.00 |
| 5KR-1300SC | 6.0 | 1300 | FLAT | 15.00 |
| 5N-1400SCR | 6.0 | 1400 | FLAT | 19.00 |
| 5KR-2000C | 6.0 | 2000 | FLAT | 24.00 |
| 5KR-4400D | 6.0 | 4400 | FLAT | 40.00 |
| 5KR-5000DE | 6.0 | 5000 | FLAT | 50.00 |

TRANSMITTER PACKS

| | | | | |
|----------|-----|-----|------------|-------|
| 8N500AA | 9.6 | 500 | 1X8 AA | 18.00 |
| 8N600AA | 9.6 | 600 | 2X2X2 high | 20.00 |
| 8N750AAE | 9.6 | 750 | 1X8 AA | 22.00 |
| 8N750AAE | 9.6 | 750 | 2X2X2 high | 22.00 |

POWER PACKS

| | | | | |
|-------------|-----|------|------|-------|
| 6N-800AR | 7.2 | 800 | FLAT | 20.00 |
| 6KR-1300SC | 7.2 | 1300 | FLAT | 18.00 |
| 7KR-1300SC | 8.4 | 1300 | FLAT | 20.00 |
| 6N-1400SCR | 7.2 | 1400 | FLAT | 22.00 |
| 7N-1400SCR | 8.4 | 1400 | FLAT | 25.00 |
| 6KR-1700SCE | 7.2 | 1700 | FLAT | 28.00 |
| 7KR-1700SCE | 8.4 | 1700 | FLAT | 31.00 |
| 6KR-2000C | 7.2 | 2000 | FLAT | 30.00 |
| 6KR-4400D | 7.2 | 4400 | FLAT | 50.00 |

GELL CELLS

| | | | |
|---------|-----|------|---------|
| 6 Volt | 1.2 | A.H. | \$12.00 |
| 12 Volt | 0.5 | A.H. | \$15.00 |

VISA, MASTERCARD,
DISCOVER

\$3.00 SHIPPING & HANDLING
6% SALES TAX FOR FL RESIDENTS

ORDER TOLL FREE

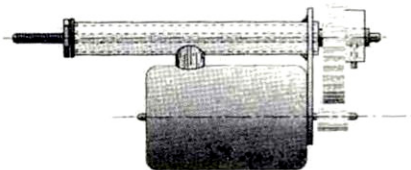
800 • 346 • 0601

FAX 407-682-4469

AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," Model Airplane News, 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

Puller Configuration



MINIATURE ELECTRIC-DRIVE MOTOR

After reading the "Build a Miniature Electric-Drive System" article in your July issue, I wish to inform you that we stock motors that are similar to the AYK noted there. There are two types of motors: (1) can diameter: 24mm; shaft diameter: 2mm; length: 40mm; weight: 55 grams; and (2) can and shaft diameter: the same as above; length: 33mm; weight: 45 grams. Both have a 64-pitch brass pinion with 12 teeth attached. The motors have an open endbell with replaceable brushes but fixed timing and bronze bushings instead of ball bearings.

We use these motors in micro R/C electric helicopters. We also have 64-pitch spur gears of 90, 92, 98, 102, 106, 110, 115 and 120 teeth with 3/8-inch-diameter holes to match. The price of the motor with pinion (airmail charge inclusive) worldwide is \$18 each (American currency)—advance payment. Add \$3 for each spur gear.

They're superlight: the 90-tooth gear weighs about 2.25 grams, and the 120-tooth about 3.25 grams.

For the last 10 years, I've designed and manufactured R/C parts. My way of depressurizing the work load is to stretch-build slope-soaring gliders. Most are scale ships such as the Boeing 747-400, YF-23, P-51 and B-2 Stealth Bomber. I also have videotapes in NTSC format to show how they perform. Can you change them into photos and publish them in *Model Airplane News*?

ALFRED KONG

57, Au Pui Wan St., 9/F., Unit 20
Leader Industrial Centre, Shatin, N.T.
Hong Kong

Alfred, thank you for the information about your motors. Many of our readers have a keen interest in designing and flying miniature electrics, whether they're slow-flying, high-lift, indoor R/C aircraft or sleek outdoor ships such as those shown by Tom Davis in the article to which you refer. I'm

sure some of them will contact you. We've seen the conversions from video to still photography, but are not performing them in the normal course of business at this time. High-quality photos are preferred—sharp black-and-whites with good contrast, or, if the subject is "Air Scoop" material, sharp, rich color slides (although prints can also be used). As to whether we would publish them, we have to see them before we can answer that question!

Readers who are interested in the miniature electric-drive system described in our July issue (6- to 11-minute, full-power flights) will be interested in the following updates. The Cox spur gear mentioned there hasn't been carried by Cox for some time and is now sold by REH Distributing, 4415 Marburg Ave., Cincinnati, OH 45209. The materials list in the article didn't include the two 2x4mm socket-head cap screws used to retain the front bearing plate. The manufacturer of the plastic tube mentioned in the article is Evergreen Scale Models, 12808 NE 125th Way, Kirkland, WA 98034, and the bearing manufacturer is National Precision Bearing, P.O. Box C34140, Seattle, WA 98124.

Any modelers who are making headway pushing the miniature electric envelope, please let us know. We'd like to report your progress to our readers. TA

SUPERSONIC PROPS

Your answer to Jim Miller of Albuquerque, NM (August '92 "Airwaves"), on "Supersonic Props" was excellent, but it could have been said in a much simpler synopsis.

The tip speed of a 10-inch prop turning at a given rpm will be 1/12 that of a 10-foot prop turning at the same rpm, since there are 12 inches to a foot. If that 10-foot prop is making its tips go supersonic at 2,100rpm (at approximate sea level), then the model's 10-inch prop will have to turn 12 times faster, or 25,200rpm (2,100 x 12 = 25,200) to run its tips supersonic—considerably beyond the speed range of most model reciprocating engines.

BILL SHEPPARD

Director, Mod Aire Aero Systems
San Francisco, CA

Bill, we appreciate your summary! We also had fun putting together the diagram in our

(continued on page 10)

IN MEMORIAM

ART KRAMER

Art Kramer, president and founder of Coverite, died on September 25, 1992. He devoted the last 25 years of his life to the company and to the modeling community. With his innovative, creative energy, he built the company into the diverse industry it is today.



Art's son Josh, now president of Coverite, reflects: "I will never again share the joy of working side by side with my father, but through Coverite, his dreams and aspirations will continue. Coverite's incredible growth and success this year has been a bittersweet tribute to his visions."

Art was a bright spot in the industry. His personality and wit lifted the spirits of all who knew him.

FRANZ KAVAN

Franz Kavan, founder and owner of Kavan, the German modeling company, died in Nuremberg, Germany, on July 18, 1992, at the age of 75. An active modeler, Franz pioneered the development of the R/C carburetor. His company develops and produces high-quality models and accessories, sold in the U.S. by Hobby Lobby International.

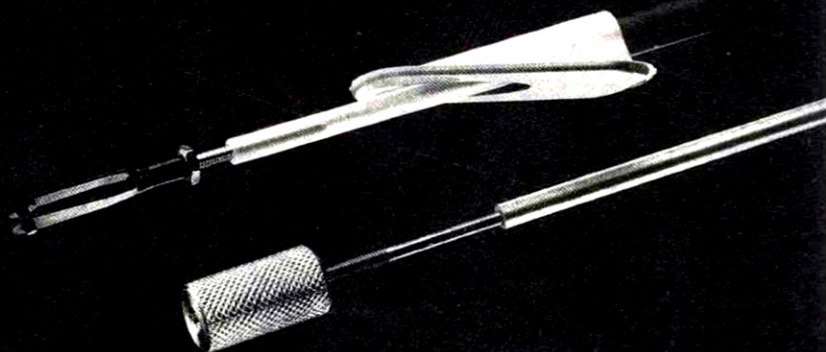


In 1969, Kavan introduced the Jet Ranger, the first successful scale aerobatic R/C helicopter. Another accomplishment is the FK-50, a 3.0 cubic inch engine, twin cylinder, 4-stroke replica of the famous "Continental" aircraft engine.

Kavan's daughter Andrea will continue the traditions established by her father.

LAZER RODS

Easy Installation. Smooth Operation. Outstanding Reputation.



DU-BRO's Lazer Rods include 4" threaded push rods which fit inside the inner tube allowing for greater strength exiting the aircraft. Available in 36" & 48" lengths—All hardware included.

Also available are Lazer Rod Push Rod Exits for a flush, clean exit, and the Threaded Stud Driver, making threading 1" studs or threaded rods into plastic push rods simple.

For a Free Catalog send \$1 for shipping & handling:

DU-BRO

DU-BRO Products • P.O. Box 815 • Wauconda, IL 60084

SOUNDMASTER
MUFFLERS and PIPES

A SOUND INVESTMENT!

Alloy Steel!
Lightweight!
Fits All Engines!
26 Models .25 to 5.8
4-Stroke and Helicopter!



"TESTED 88 DB AT 3 METERS"

Clarence Lee . . . RCM Engine Clinic

"A MUFFLER THAT THINKS IT'S A PIPE"

Don Lowe . . . President AMA

"STILL THE MOST EFFECTIVE MUFFLER"

Howard Crispin . . . AMA Sound Committee

Call (203) 877-1670 or send a 75¢ #10 SASE & \$2.00

DAVIS MODEL PRODUCTS
PO Box 141 • Milford, CT 06460

Dealer Inquiries Invited

Leader In Small Airfoil Technology

MASTER AIRSCREW for ELECTRIC MODELERS

ELECTRIC FLIGHT PACK

The Electric Flight Pack will deliver improved flight times and an increased rate of climb over direct drive. This motor/gearbox/folding prop kit was designed for the beginning to intermediate electric modeler and similar models. The kit comes completely assembled with 7.2 volt 05 can ferrite motor, gearbox and 12x8 folding propeller with spinner. The unit is available in three gear ratios: 2.5, 3.0 and 3.5:1. Wiring is not included. **\$39.95 suggested retail**



GEARBOXES

FOR 05 ELECTRIC MOTORS

Gear reduction can dramatically improve performance and the Master Airscrew Gearbox is the ideal choice. This lightweight, compact unit overcomes the frustrations of bent shafts and stripped gears. It's unconditionally guaranteed against bending. An output gear is molded directly on the shaft. Two precision ball bearings support the drive shaft. It will accept most standard motors used for flight and has a 1/4" prop shaft to accommodate large diameter wood props. Rated at 240 watts input in field trials. **Suggested retail is \$15.95**



FOLDING PROPELLERS

Our folders have wide, under-thrust and longer glide. The blades hinge to an aluminum hub and a nylon spinner completes the assembly. In sizes 12x8 and 15x12. **Suggested retail is \$8.95 and \$9.95**



Direct Drive 05 Prop Adaptor

The all-aluminum prop adaptor is designed for 05 electric motors and is recommended for use with Master Airscrew 7x4, 7x6, 8x4 and 8x6 propellers. Stock number MA3200. **\$3.95 suggested retail**



**See your Hobby Dealer for Master Airscrew
Propellers & Accessories for Electric Flight**

SASE for FREE Catalog

WINDSOR PROPELLER COMPANY
3219 Monier Circle ■ Rancho Cordova, CA 95742

AIRWAVES

(continued from page 8)

"Airwaves" answer, because we felt that many modelers may not have seen the geometry of prop rotation depicted in that way. But you're absolutely right—your answer was far more succinct. TA

SIMPROP SERVO

Hello to the great staff of *Model Airplane News*!

I've been enjoying your magazine for several years now. I got started in R/C while I was stationed in Japan with the Navy five years ago, and I've really come to depend on all the great information and tips available from your excellent magazine. Now that I'm stationed back in the real world and living in a house instead of on a ship, I finally have room to finish all those projects.

When I left Japan, I lucked into a great buy on a pattern ship made by MK, called the "Hippo." I paid a ridiculously low price for the assembled, flight-proven aircraft with a Rossi .61, a pipe and retracts. This is a beautiful aircraft, and all I need to do is install a radio and go flying! But I have JR and Futaba radios. The servo is made by a company called "Simprop." Could you "puuhleese" tell me how to hook up JR and Futaba plugs to the black, blue and red leads coming from the Simprop retract servo?! I have no idea which is which, and I don't want to destroy the retract servo in the process.

Thanks in advance for your help.

LT. WILLIAM G. LOTZ
Meridian, MS

Bill, sounds as if you got a really good deal in Japan. Now that you're back in the States, you can cash in on your investment at the flying field.

Simprop has a reputation for good-quality products, and if your Hippo is built as well as you say, you should get good service from the equipment.

The conversions for the Simprop leads are:

Simprop black wire matches orange on JR and white on Futaba. Simprop blue wire matches brown on JR and black on Futaba, and the red Simprop matches red on both JR and Futaba. You can solder on an appropriate plug to

(Continued on page 136)

AIR SCOOP

CHRIS CHIANELLI



New products or people behind the scenes—my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares?—it's you, the reader, who matters most! I spy for those who fly!

It's Back

Those of you who have been in the hobby for more than 15 years will remember the name Nitrotane—a registered trade name, not some new chemical. Its manufacturer, Space Age Fuel (an affiliate of Davis Diesel), never left the fuel business—just the glow part—and has been producing increasing amounts of diesel fuel to Bob Davis's specification, for Davis Diesel Development over the years.

Now my friends, I know Bob Davis; I've worked with Bob Davis; Bob Davis is a friend of mine; and he is a cantankerous perfectionist. Now, maybe he isn't the type of guy you want to sit down



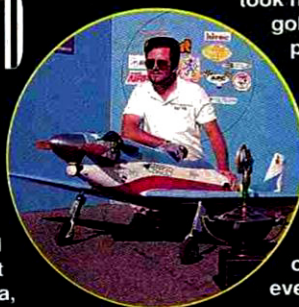
to dinner with every single night of the week, but he is the type we want to scrutinize the contents of the glow fuel we run through our expensive engines. There has been much skepticism about the integrity of fuel content in the past few years. That's why Bob



UNLIMITED THRILLS!

Here are a few highlights from the latest Unlimited and AT-6 races that were held in Madera, CA. Center: pilot Don Rice and his Aerrow 200-powered, scratch-built P-51 "Miss America," which took first place in the Unlimited Gold Class on September 27. Owned by Paul Ross, the plane flew at a relative speed of 145.7mph during the trophy race.

The action photo (top left) is of the Miller/Krohn-sponsored Sea Fury (no. 88) piloted by Mike Helsel and powered by an



Aerrow 200. This top qualifier flew gloriously, but met an untimely end when it shed a wing part during a high-speed pass and was forced to ditch.

The photo at the bottom right shows the lineup of the AT-6-class planes just before the race. All planes were powered by Zenoah G-62 engines with props and fuel being provided by the race organization to keep things fair. Mike Adams

took home the gold with airplane no. 6 (second from the front). See our next issue for a full write-up on this event.



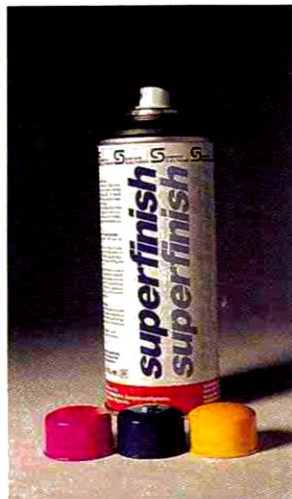
has decided to reintroduce Nitrotane, and he assures us that Nitrotane has pure, unadulterated ingredients.

Nitrotane comes with 10 percent nitromethane—the correct amount for 90 percent of all types of R/C flying—in either 20 percent lubrication (for most

engines) or 14 percent lubrication for big engines or large 4-strokes. Bob guarantees a full measure of oil that is a 50:50 mixture of castor and synthetic. Nitrotane comes in high-density bottles to preserve it. Contact Davis Model Products, P.O. Box 141, Milford, CT 06460; (203) 877-1670.

Supermatch with Superfinish

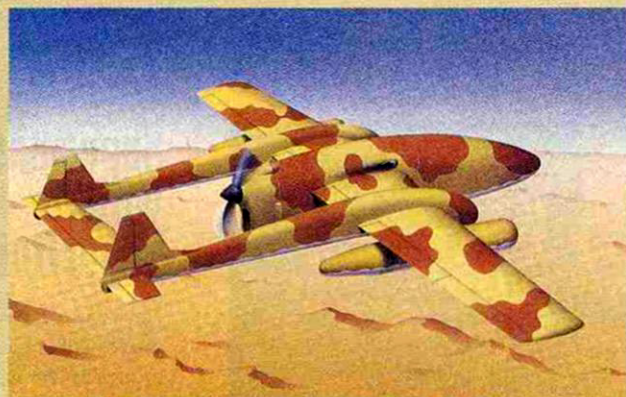
Now you can cover your model with an iron-on covering and feel secure that you'll be able to match the parts of the plane that



require painting. Hobby Lobby International now offers Superfinish—Simprop's new polyurethane spray paints, which are color-matched to Hobby Lobby's Oracover and Carl Goldberg's Ultracote film coverings. These paints are fuelproof, fast-drying and highly elastic.

The 14-ounce cans come in 13 colors and have color-coded caps for easy identification. The Superfinish paints are labeled "ozone-safe." For more information, contact Hobby Lobby International at (615) 373-1444.

AIR SCOOP



L&R Aircraft Ltd. of Burton, OH, committed much time and design effort to the "S" Series project, which has now been formally proposed to Naval Air Systems Command, the department in charge of military RPVs (remotely piloted vehicles).

The high-performance Airtrax "S" Series, which is in many ways a direct descendant of the giant-scale Airtrax "Q" model, is a 60-percent-scale version of the full-scale RPV. The 120-inch-span design weighs only 28 pounds (empty) yet has a 25-pound maximum payload.

The Quadra 100-powered "S" has a top speed of 168mph, a maneuvering speed of 105mph, a stall

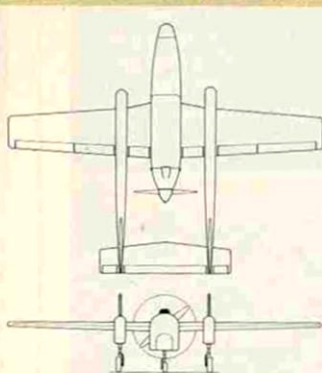
SP4TRAX RPV

speed of 22mph and can pull three positive and two negative Gs. Though the

final military version will no doubt feature rail launching and parachute recovery, this prototype can ROG (empty) in 90 feet and land over a 50-foot obstacle in 150 feet using Robart retracts. The Airtrax "S" features interchangeable front mission pods for

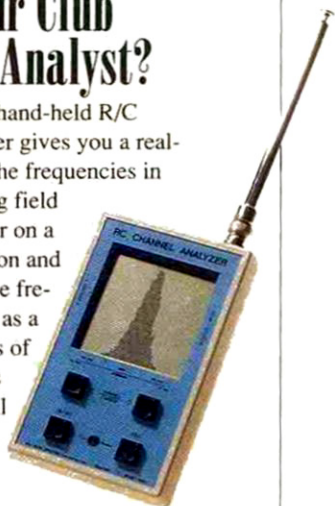
biological, chemical and nuclear surveillance. Day/night infrared and electronic/communication jamming are also its intended missions.

Rumor has it a smaller version will be available to modelers. For more info, contact L&R Aircraft, 13645 Fisher Rd., Burton, OH 44021; (216) 834-1578.



Does Your Club Need an Analyst?

James Hauser's hand-held R/C Channel Analyzer gives you a real-time display of the frequencies in use at your flying field (center the cursor on a given transmission and it will tell you the frequency), as well as a close-up analysis of any transmitter's output (RF signal power in decibels and signal spread in KHz).



This miniature marvel has been upgraded to include the 50, 53 and 75MHz bands in addition to 72MHz. Although not advertised as a spectrum analyzer to verify a transmitter's exact signal, it will show you whether a transmitter is sending out a signal that's outside the appropriate range and therefore needs a checkup. To facilitate this, a new feature in the zoom mode displays the peak values after every 10 sweeps of a transmitter signal.

Many units have been sold to clubs—the primary users. A 72MHz-only version is available for \$695, and the new four-band version costs \$796. Customized versions are available for overseas customers. Contact Aero Spectra Corp., P.O. Box 3021, Boulder, CO 80307; (303) 499-2584.

MIDWEST CHEROKEE 40

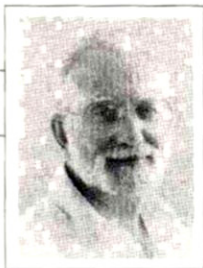
Midwest Products marketing director Ed Rogala (left) and designer Tom Herr are shown here with the latest "Success-Series" R/C kit—the Cherokee 40. With the wide acceptance of the Mustang, the ME 109 and the Sukhoi, it's fitting that Midwest has come up with a scale subject that's right for intermediate pilots. With its

attractive scale lines, simple construction and ample wing area (664 square inches), the Cherokee certainly fits this bill. It's perfect for pilots who have soloed on a basic trainer, are ready to step up to an aileron trainer, but hate the looks of boxy, shoulder-wing airplanes. Watch for a full review in these pages in the near future.



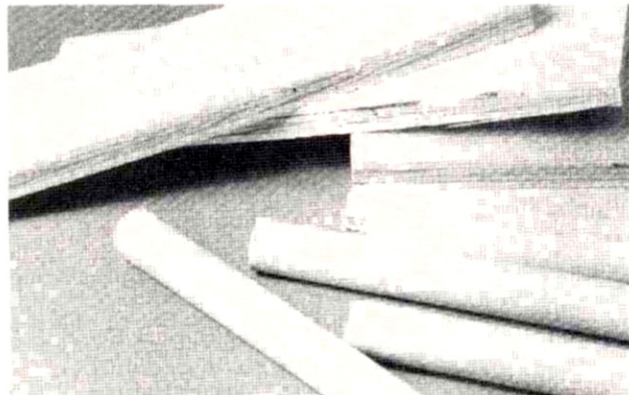
How To:

R A N D Y R A N D O L P H



MAKE A BROOMSTICK FUSELAGE STAND

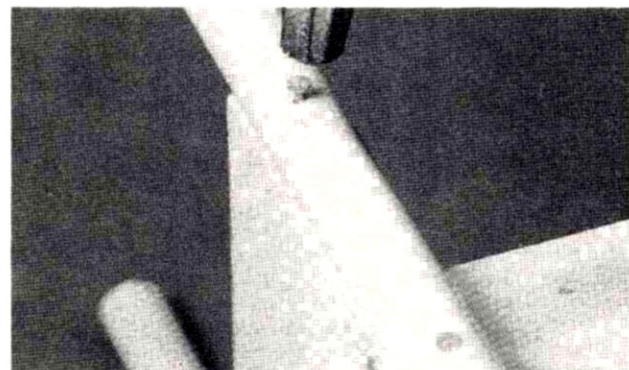
It's very difficult to work in the radio compartment of a low-wing airplane unless it can be held inverted on your workbench. Here's a way to make an inexpensive stand that you can tailor to your needs.



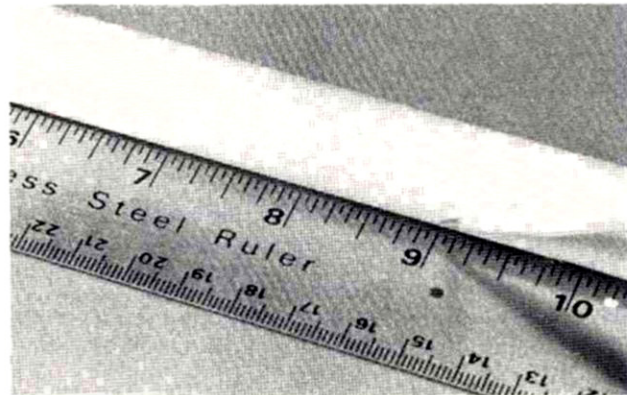
1. You'll need four pieces of $\frac{1}{2}$ -inch plywood or $\frac{3}{4}$ -inch pine, a broomstick, some pipe insulation, a saw, a drill, a hammer and nails.



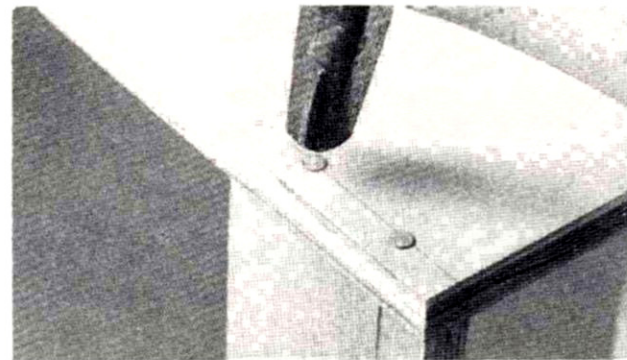
3. With a $\frac{3}{32}$ -inch drill, drill two holes in each piece of broomstick. Drill one hole about an inch from the end and the other 3 inches above the first.



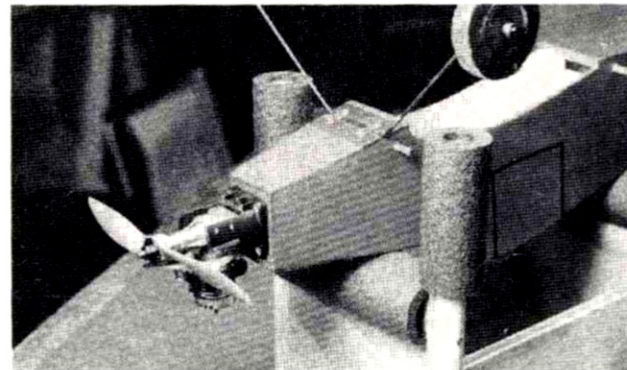
5. Hold the broomsticks flush with the bottom of the plywood box, and nail and glue them to the sides of the end pieces. The holes make this simple.



2. Saw the broomstick into four equal pieces. Usually, a broomstick is a little over 3 feet long, so you can cut four 9-inch pieces.



4. Cut two 6-inch-wide and 5-inch-high pieces of wood, and two that are $2\frac{1}{2}$ inches wide and 12 to 18 inches long. These dimensions aren't critical, but they work well for most medium and small airplanes. Nail and glue them together to form a box (put the longer pieces inside the wider end pieces).



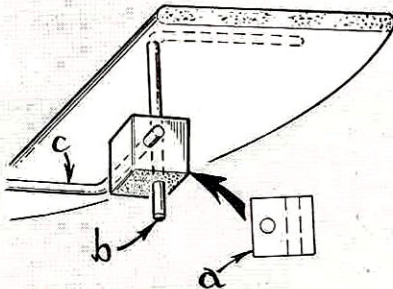
6. Slip pieces of pipe insulation over the broomsticks, and split it to fit over the end pieces. To form a well for tools and parts, cover the bottom with $\frac{1}{8}$ -inch bakelite or thin plywood.

HINTS & KINKS

J I M N E W M A N



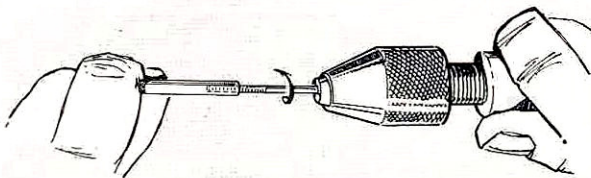
Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 251 Danbury Rd., Wilton, Ct 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



MINI CONTROL HORNS

If even the smallest molded horns look too clumsy for your very small models, try this: (a) is a $\frac{3}{32}$ -inch (2.5mm) square nylon block. The vertical hole is drilled so that the wire horn fits tightly (b). The pushrod fits freely in the horizontal hole (c). To adjust the throw of the horn, press the block up or down on the wire horn.

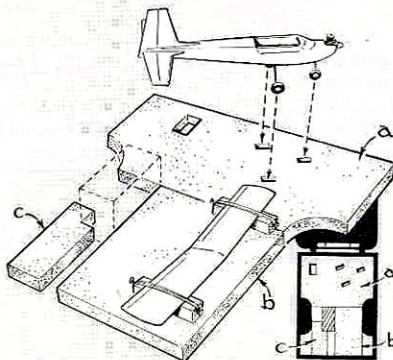
Bob Hanen, Muskegon, MI



INSERTING PUSHRODS

It's a lot easier to thread steel pushrods into plastic inner Nyrods if the threaded rod is gripped in the chuck of a drill. In fact, if you have a variable-speed drill, you can wind the pushrod in under power at a very slow speed.

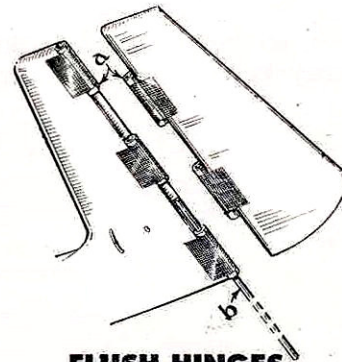
Roger Caron, Palo Alto, CA



TRUCK-BED TIE-DOWN

Slabs of 2- or 3-inch-thick (50mm or 75mm) foam, with the appropriate holes cut in them, are a great way to prevent models from sliding around in the back of your truck. The piece marked (a) holds the wheels of the model (you can make another cutout for the fuel can, if required), and (b) has foam blocks and nails glued to it, allowing the wing to be held in place with rubber bands. The final piece (c) is wedged in last to hold the flight box (shown with dashes). You can embed wire hooks in the foam and clip them over the gear legs.

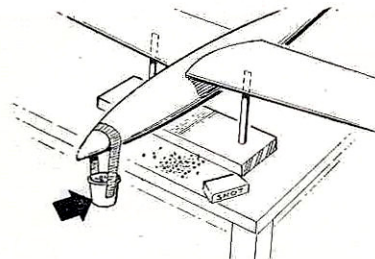
Marc De Angelis, San Diego, CA



FLUSH HINGES

Glue pieces of Nyrod (a) to the rudder and fin with small pieces of nylon tape. When the rudder and fin are aligned, insert a piece of inner Nyrod through the outer, short pieces to form a very free-running, clean hinge that will be practically invisible under the covering. Secure the Nyrod hinge pin at the bottom with a small wood screw and a metal tab.

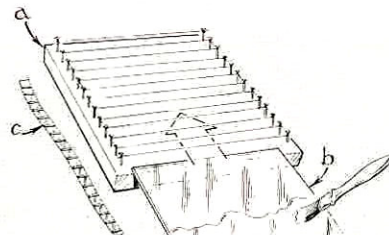
Clyde Hooker, Hope Mills, NC



NOSE-WEIGHT TRICK

Balancing nose weight on a smoothly contoured, newly finished model is nearly impossible. Tape a small paper cup to the nose, as shown, and add the weight into the cup. (The cup and tape are too light to be of any real consequence in the initial balancing.)

Tom Rent, Lakeville, MN



RIB STITCHES

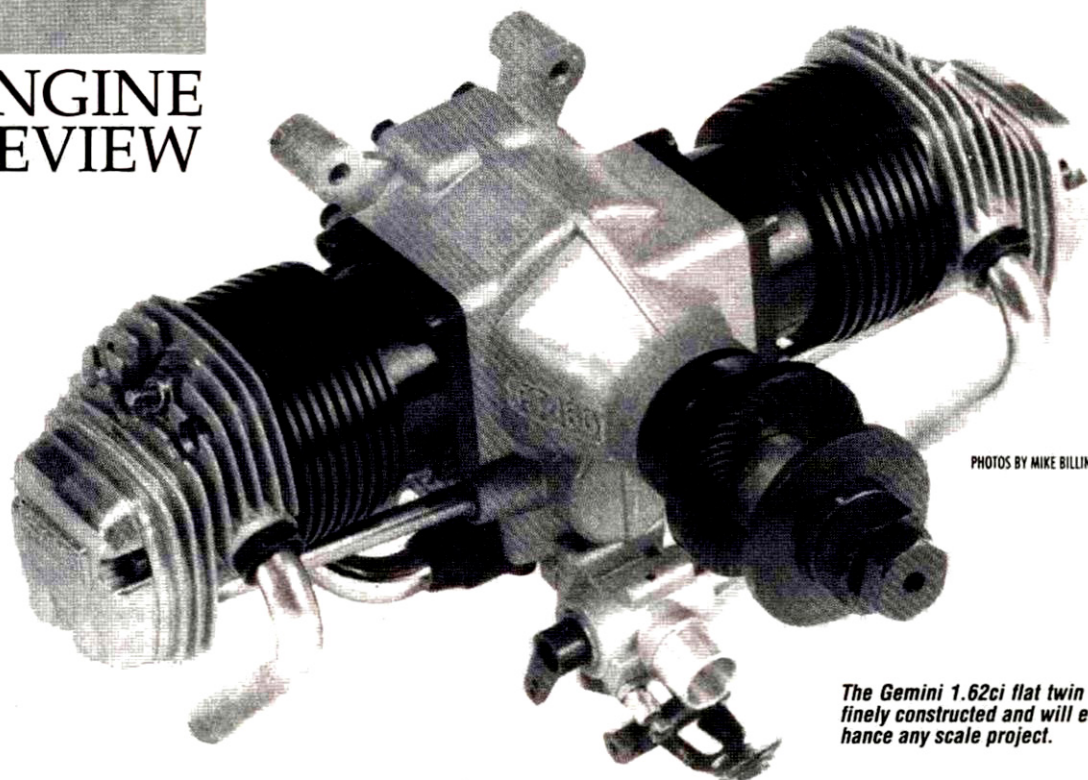
Into a piece of board, drive nails the same distance apart as rib stitches usually are. Wind thread back and forth around the nails, about $\frac{1}{2}$ inch (13mm) off the board. Coat a sheet of glass (b) with nitrate dope, slide it under the threads, and push the threads down into the dope. Apply another coat of dope, allow it to dry, and cut strips of rib stitches (c) as shown. Apply them like cap strips over covering. Last, apply rib tapes over the dummy stitches. Note: this tip can only be used if nitrate is compatible with your plane's finish.

Bob Baldwin, Surrey, BC, Canada

by MIKE BILLINTON

ENGINE REVIEW

FT-160
S
O.S.



PHOTOS BY MIKE BILLINTON

The Gemini 1.62ci flat twin is finely constructed and will enhance any scale project.

A DIAMETRIC MARVEL

DEPENDING FROM WHICH end of the "modeling" size range one views it, this up-rated, O.S. Gemini, 1.62ci, flat, twin, 4-stroke is either a large, complex, relatively powerful model engine (for "large" R/C aircraft), or it's a highly refined, very sophisticated small model 4-stroke engine with a fair number of small parts that require a delicacy of touch in adjustment or dismantling (when compared with virtually any of the large-capacity, converted, industrial 2-stroke engines from 50cc up to 200cc or

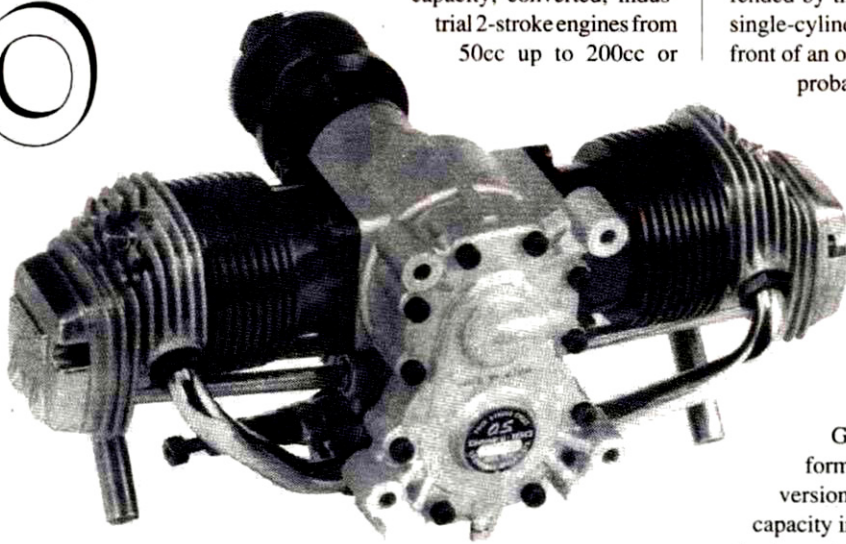
more—Zenoah, Sachs Dolmar, 3W, Titan, etc.).

This is a major consequence of its manufacturer's laudable aim to provide only "scale" type, multi-cylinder, 4-stroke engines—the smaller Gemini 120, Super Gemini 3ci and 2.40ci, the impressive Pegasus flat-four in 3.2ci and 2.4ci sizes and last, the Sirius 5-cylinder, rotary 4-stroke of 3ci.

The real scale aircraft enthusiast who might be offended by the sight of a huge, though highly effective, single-cylinder industrial engine protruding from the front of an otherwise pristine, scale, light aircraft would probably be better served (both aesthetically and in certain scale competitions) by any of the beautifully constructed O.S. "scale" 4-stroke multi-cylinder units mentioned.

Clearly, cost differences must follow the complications of construction when compared with the simple industrial engine, which also has the advantageous economies of bulk production.

Based on the typical light-plane "continental" flat-twin layout, the O.S. Gemini FT-160 is in any event a serious performer—not just a pretty face. It is a developed version of the earlier FT-120 (20cc) flat twin with a capacity increase to 1.62ci (26.5cc) following a large boring-out exercise from the earlier 0.945 inch to the



The rear cover/mount is soundly designed to take mounting stress.

new 1.091 inches. The new and well over-square stroke/bore ratio is now 0.793:1.

In keeping (one supposes) with the "scale" layout, it arrives ready to operate without any mufflers (nor with any available as extras). But as the scale aspect extends also to the low and quiet rpm operating range, this is probably a realistic position for the O.S. designers to take.

The dB test figures did show the FT-160 reading above USA and UK recommendations, though the noise of the low rpm is quite inoffensive.

MECHANICAL DETAIL

The one-piece twin-throw crankshaft gives $\frac{1}{2}$ inch offset between the two cylinders. It necessitates the use of split connecting rods that are bolted together around each crankpin. Consideration of thread strength and compatibility of bearing surface has led O.S. to use a strong bronze alloy to form the conrod and matching cap. This results in heavier-than-average rod construction (almost $\frac{1}{2}$ ounce each), but this disadvantage is nullified by the inherent balance of the flat twin and the low rpm regime combined.

Assembling the rod caps requires the removal of one piston and is a tricky affair using two very small Allen-head screws to secure the big end cap. Precise fitting of an Allen wrench of the correct size is essential, or failure will be likely (with ever-present danger of damaging the very small socket cavity and threat of almost permanent immovability thereafter).

Therefore, unnecessary dismantling in this area is inadvisable.

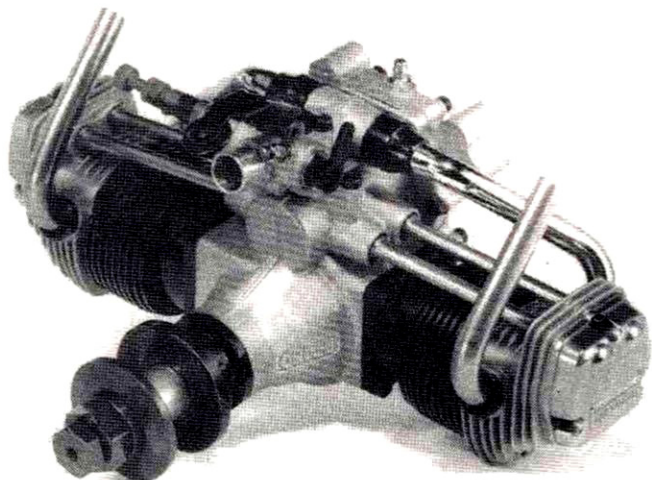
The main crank-timing pinion is unusual because it's part of the original forging and also, because part of the gear-teeth periphery is seated in the rear, main, ball race.

After removing the rear cover/mounting bracket, the crank and rear bearing can easily be removed rearwards from the main casting and the front, two, main crank bearings. The implication of this is that, unless a propeller or spacer and propeller nut are securely in place, it is easily possible to move the crank backwards and damage the rear cover and/or strain the conrods, etc.

The half-time cam wheel is precisely supported by small bearings in the crankcase and cover. Both the pinion and the cam wheel are marked to ensure correct repositioning.

Ferrous liners are ground to size, and then "Nikasil"-plated; and with high-strength, normal-expansion, single-ring, alloy pistons, presents a fairly orthodox piston/liner combination—fitted at an approximate 0.003-inch clearance.

Single, unpegged, cast-iron piston rings are used, and the resultant met-



The FT-160 upside-down—not the best way to operate it, because in this position, surplus oil can't drain away. Exhaust stubs can, however, be rotated to any position that suits the installation.

allurgical setup requires a fairly generous running-in period (around an hour or more) to achieve good bedding-down of the ring and, thus, improved compression.

The inlet and exhaust have the same valve-head size (10.4mm), with the passageways behind the heads being 9.6mm.

O.S. continues with the one-piece brass plug in the cylinder head from which the valve guide and valve seat are both machined.

Valve timing is biased toward a lengthy inlet period of 297 degrees, with late closure of the valve to well after BD. (bottom of stroke).

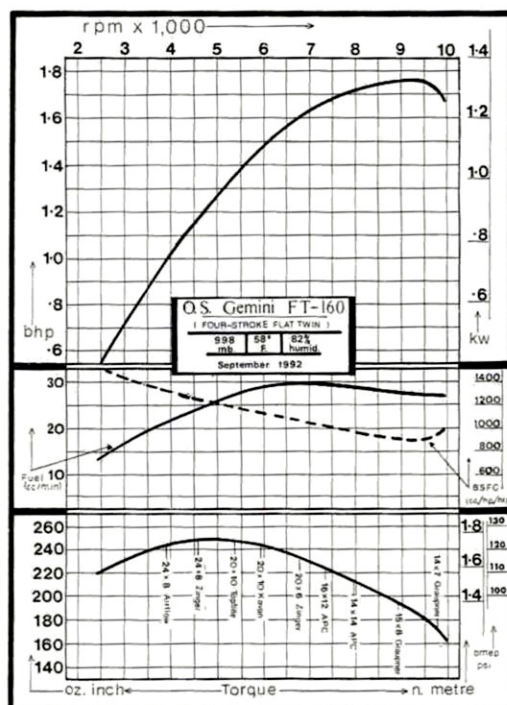
The exhaust is more conservatively timed to give 270 degrees

total period. There is a resultant longish overlap of near 90 degrees (the crank angle from when the inlet valve first opens prior to the final closing of the exhaust valve), i.e., both valves are open during this period.

A long overlap usually leads to improved higher speed performance to the detriment of lower-speed torque, while also increasing fuel consumption. The FT-160's carefully poised overlap period of 89 degrees appears to avoid these twin disadvantages—as the power tests reveal.

From a central position, a single and simple air-bleed-style carburetor of 6.3mm bore is of adequate size to feed each cylinder on alternate strokes via long induction tubes.

A very useful (even necessary) spring-loaded choke valve for cold starting is fitted and, with a wire



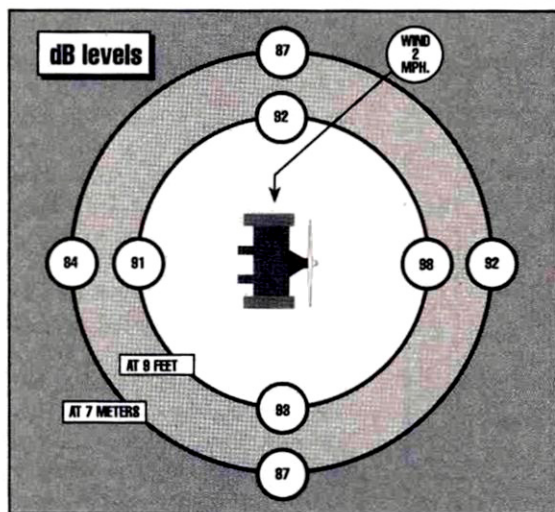
SPECIFICATIONS

WEIGHTS & DIMENSIONS

| | |
|-----------------------------|---|
| Capacity: | 1.6182 cubic inches (26.52cc) |
| Bore: | 1.091 inches (27.72mm) |
| Stroke: | 0.8655 inch (21.9837mm) |
| Stroke/bore ratio: | 0.793:1 |
| Timing periods: | Inlet opens—43° BTDC Inlet closes—74° ABDC—Total 297° Exhaust opens—44° BBDC Exhaust closes—46° ATDC—Total 270° Overlap—89° |
| Combustion volume: | 1.96cc |
| Compression ratios: | Geometric—7.76:1 |
| Cylinder-head squish: | 0.050 inch (1.27mm) |
| Cylinder-head squish angle: | 0° |
| Squish-band area: | 0.015 square inch (1.6 percent of piston area) |
| Carburetor bore: | 0.248 inch (6.3mm) |
| Crankshaft diameter: | 0.512 inch (13.0mm) |
| Crankpin diameter: | 0.392 inch (9.96mm) |
| Crankshaft nose thread: | 0.309 inchx24 TPI (8x1mm) |
| Wristpin diameter: | 0.236 inch (6mm nominal) |
| Connecting-rod centers: | 1.53 inches (39mm) |
| Engine height: | 3.95 inches (100mm) |
| Width: | 7.6 inches across heads (193mm) |
| Length: | 4.1 inches (104mm) |
| Frontal area: | 13.8 square inches |
| Weight: | 39.6 ounces (1,124g) |
| Crankshaft weight: | 5.5 ounces (156g) |
| Piston weight: | 0.40 ounce (12g) |
| Connecting rod weight: | 0.45 ounce (13g) |

Performance:

| | |
|--------------|---|
| Max. b.hp: | 1.76 @ 9,378rpm (open exhaust/10% nitro) |
| Max. torque: | 250 ounce/inches @ 4,868rpm (open exhaust/10% nitro) |



Engine: O.S. Gemini FT-160 (26.5cc)
 Equip: Open exhaust
 Fuel: 10 percent nitro
 Prop: 20x10 Kavan (fiberglass)
 rpm: 5,900
 Temp: 57 degrees F
 Humidity: 82 percent
 Meter: Class 2 Castle CS182B with GA601 calibrator set to NPL standard.
 Height: Meter and engine were 1 meter above concrete surface.

Rpm on standard props

| | |
|------------------------|-------|
| 24x8 Airflow | 3,784 |
| 24x8 Zinger | 4,610 |
| 20x10 Mastro | 4,752 |
| 20x10 Top Flite | 5,296 |
| 20x10 Kavan fiberglass | 5,920 |
| 18x7 Mastro | 6,417 |
| 18x8 Top Flite | 6,715 |
| 20x6 Zinger | 6,770 |
| 16x12 APC | 7,320 |
| 14x14 APC | 7,980 |
| 15x8 Graupner | 8,869 |
| 16x6 Airflow | 8,902 |
| 14x7 Graupner | 9,765 |

Performance equivalents:

| | |
|---------------------------|-------|
| b.hp/ci | 1.087 |
| b.hp/cc | 0.066 |
| b.hp/lb | 0.71 |
| b.hp/kilo | 1.57 |
| oz. in./ci | 154.5 |
| oz. in./cc | 9.42 |
| oz. in./lb | 101.0 |
| Newton meter/cc | 0.067 |
| b.hp/sq. in. frontal area | 0.127 |

Manufacturer: O.S. Engines, Osaka, Japan
 Distributor: Great Planes Model Mfg. Co.,
 P.O. Box 721, Urbana, IL 61801.

extension fitted, it's a valuable aid to quick starts. The problem the choke is designed to overcome is that, when the engine is mounted in the usual scale orientation (carb. underneath), access to manual choking is almost impossible owing to the proximity of the propeller and, as the carb is tilted downward, any excess fuel that can usually help with cold starts is spilled away downward. A wire extension to the main fuel needle is also advisable for "peaceful," safe operation.

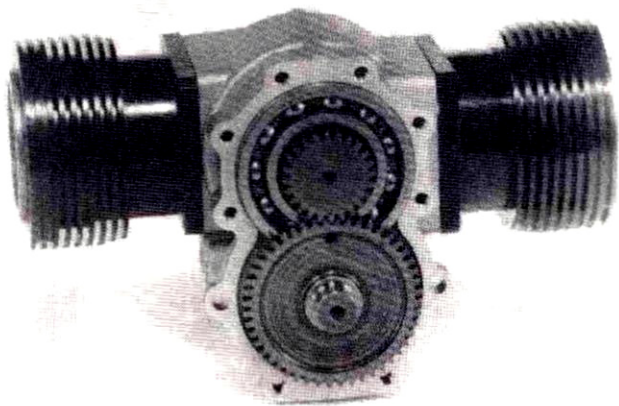
O.S. now offers a new propeller nut and matching locknut to replace the earlier single nut and four or six small propeller screws. The present propeller-driver is still drilled-out for the four-screw fixing and, in many cases, this could result in a more scale appearance. For most model engines, however, the reality is that generally less hazard is involved by using the locknut style without the multi-bolt fixing. Very firm tightening of the central bolt is, of course, called for, and its rechecking at appropriate times, e.g., before every flying session, is strongly recommended.

PERFORMANCE

As a matter of preference, the O.S. F-type (4-stroke) glow plugs were wired up in series to prevent the loss of the remaining plug if one happens to burn out in the first instance.

The fuel used was in accord with O.S. instructions (between 5 and 15 percent nitromethane and initially more than 16 percent castor and/or synthetic oil). Actual figures were: 10 percent nitromethane and 18 percent ML70 synthetic oil.

A wide range of propellers was pressed into service following the running-in period—wider in fact than the O.S. suggested starting range



When the hole in the large cam wheel and the punch-dot in the crank pin are adjacent, you have correct timing.

from 15x8 up to 20x6. These sizes probably reflect O.S.'s concern at the possible use of over-heavy propellers too soon.

This extension of the rpm range—particularly downwards—followed clear indications (once running-in was complete) of strong, untroubled operation, even below 4,000rpm.

Confirmation of this advantageous situation (as regards scale sound and flying-field retention) came from the subsequent torque tests, which showed maximum torque appearing at 4,868rpm—the lowest I've yet seen during 4-stroke tests—and is only matched by two other 2-stroke units: the PAW 29 diesel and the Super Tigre 60cc in-line twin.

Rpm above 9,500 became unprofitable because of torque decline—probably caused by breathing restrictions. As for vibration, the FT-160 operated in sewing-machine fashion even at 10,000rpm, clearly revealing the superior dynamic balancing offered by the flat, opposed-piston layout—whether two, four, or more cylinders.

This is an obvious plus for the modeler who not only sees vibration as damaging and sound-inducing, but also as a continual potential threat to R/C reliability itself. Many of these problems can be solved with modern methods, and one can never have an operation that's too smooth. Hearing and feeling the FT-160 in full flow at, say, 6,000rpm gives a satisfactory sense that it's right for its designed purpose.

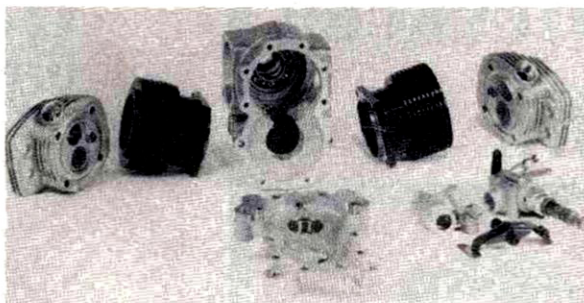
Fuel-consumption figures were somewhat better than the factory ones of around 40cc/minute. This probably reflects an advised extra degree of (safer) rich running sometimes used in actual flying performance to offset any danger of over-lean operation.

dB TEST

As mentioned, the objective data show sound levels in excess of regulations, but a few points are worth making. The test is done over concrete, and with the engine hard-mounted to a dyno; this will add somewhat to dB levels. Against this, the figures from the rear of the engine are probably lower than they should be because of the masking of the engine and exhaust stubs by the radial-mounting backing plate fixed to the dyno.



The solid bronze rods use small setscrews to fasten the cap. The twin-throw crank has a built-in cam-drive pinion. The teeth have been ground down near the web to mate with the rear bearings.



Rear cover/radial mount combined incorporates two steel dowel pegs to position the cam wheel accurately.



45 MM



60 MM

O.S. Gemini FT-160 flat twin
Full-size mounting holes of rear
cover/radial mount



55 MM



FLIGHT INSTRUCTORS NEEDED



The AirCore 40 Family Trainer

Dear Fellow Modeler:

If you are an experienced modeler, no doubt you remember your first days in the hobby. Chances are, some nice modeler reached out and lent you a hand, offering advice, guidance and a little moral support. Isn't it time you returned the favor?

GIVE THE GIFT OF FLIGHT - This year, why not bring someone new into the hobby, or be that special friend. Many people want to learn our hobby, but they need a little encouragement and someone like you to answer questions and get them started. If you invest a little time, and give back to the hobby some of what it has given to you, you will be rewarded many times over for your effort.



The Barnstormer 40 "Bullet Proof" Biplane

Our mission at U.S. AirCore is to help people learn to fly, and supply them with rugged planes that survive their learning experience. (We even offer a crash-guarantee* on the AirCore 40 Family Trainer.) Regardless of your airplane preference, we hope you share our belief that there are few hobbies offering the friendship, enjoyment or education that modeling has to offer.

George Barker *Lawrence Ragan*

George Barker Lawrence Ragan

U.S. AirCore
Model Aircraft Manufacturing

4576 Claire Chennault, Hangar 7

Dallas, TX 75248

214-250-1914

*Call or send for details of the crash guarantee. See your local hobby dealer for AirCore kits. New VHS Video Catalog available for \$7.00 plus \$3.00 shipping

(Continued on page 58)

PILOT PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage your participation. In "Pilot Projects," we feature pictures from you—our readers. Both slides and color prints are acceptable.

All the photos used in this section will be eligible for a grand prize of \$500, which will be awarded at the end of 1993. The winner will be chosen from all the entries published, so send us a photo or two and a brief description of your creation!

Send those pictures to Pilot Projects, *Model Airplane News*, 251 Danbury Rd., Wilton, CT 06897.



BEE-TWEEN 2&3

This is Mitchell Alexander's 2½-year-old daughter, Maria, and the Bee-Tween that he built from *Model Airplane News*' free pull-out plans. "This airplane has been lots of fun," said Mitch, "and I've built a couple more for other people who have seen how much fun a ½A can be." Mitchell, Maria and the Bee-Tween are from Norman, OK.

¼ SCALE & ½ SCALE

This Extra 230 is ¼ scale, and Alex, Mark Glanville's son, is ½ scale! Mark, who is from San Jose, CA, built the 230 from an Ace kit. According to him, the model flies really well with an O.S. 108.

It's very stable during landings, and it has great aerobatic capabilities. The 230 is covered with 21st Century fabric, and the cowl and the wheel pants have matching 21st Century paints.



RIGGSBEE'S GEE BEE

James Riggsbee of Chapel Hill, NC, built this ⅓-scale Gee Bee Zeta from RCM plans, which were drawn by Henry Haffke. The 6-foot-span model is an exact-scale rendition of the full-size Zeta that was designed by Pete Miller and built by the Granville brothers in 1936. The Gee Bee Zeta was a one-and-only prototype. We think 5-year-old David Riggsbee is also a one-and-only.

PILOT PROJECTS

YOUNG PATRIOTS

Here's Jeffrey Jacob's five-year-old daughter, Joelle, with his recently completed Great Planes Patriot. All three reside in Colorado Springs, CO. The ASP .46-powered Patriot has three different colors of MonoKote on the top and a dove gray Ultracote on the bottom. The color scheme was patterned after the F-5 Aggressor squadron fighter. Joelle is a big fan of R/C airplanes.



GROUND SUPPORT

This is Joseph Kraynak's Great Planes Decathlon .40 and his Lansdale, PA, ground crew (from left to right: Meghan, 9; Katie, 11; Joe, 7). The O.S. .46-powered model weighs 7 pounds; it uses a J'Tec Snuf Vibe kit; and it's covered with MonoKote and matching Black Baron paints. Joseph said he was inspired by a *Model Airplane News* review in the March '91 issue. He also said the kit was a pleasure to build.



"Z" SQUADRON

The Zwiebels of Ainsworth, NE, are proud of their Ziroli. The 27-pound, 101-inch-span model is powered by two O.S. 108s swinging 15x8 props, and it uses Robart retractable landing gear. Perhaps the Zwiebels load the operational bomb-bay doors with a couple of dozen eggs for Halloween carpet-bombing missions. Since Mr. Zwiebel didn't reveal his son's first name, we're not revealing his. Hah! See how he likes it! Anyhow, we think that his son may have built this beauty.



MOORE FUN

Meredith Moore of Amarillo, TX, sent this photo of a trio of fun: a Dynafight fun-scale Mustang with future pilots Garrett (3) and Tyler (7 months). The Mustang is powered by a side-mounted Saito .65 4-stroke engine, and it's modified with flaps and Robart retracts. Meredith writes, "To see the gear pulled up on a high-speed flyby makes the extra work worthwhile." With all the smiles, it appears that the Moore boys agree.



by JOHN E. JUNDT

ON A DELIGHTFUL Midwest Sunday afternoon in August, more than 1,750 spectators gathered in Muncie, IN, at the Academy of Model Aeronautics national flying site for the opening ceremonies of the 1992 FAI Scale World Championships. The event took place on August 23 through 29; 42 fliers from 15 countries flocked to compete in the Radio Control (F4C) division.

1 9 9 2

FAI

LET THE GAMES BEGIN!

The opening ceremonies were conducted by Geoffrey Styles, director of marketing for the AMA, in a friendly, dignified way with considerable dispatch. Speeches were kept to a minimum.

Sixteen flagpoles were arranged in an east-west line along the main runway, with a pole for each of the following participating countries: Australia, Canada, Czechoslovakia, France, Germany, Japan, the Netherlands, Norway, Poland, South Africa, Spain, Sweden, Uzbekistan, Switzerland, the United Kingdom and the United States. The pilots and team members stood behind their country's pole, were introduced, and respectfully responded as their flag was raised to the playing of their country's anthem. The games had begun.

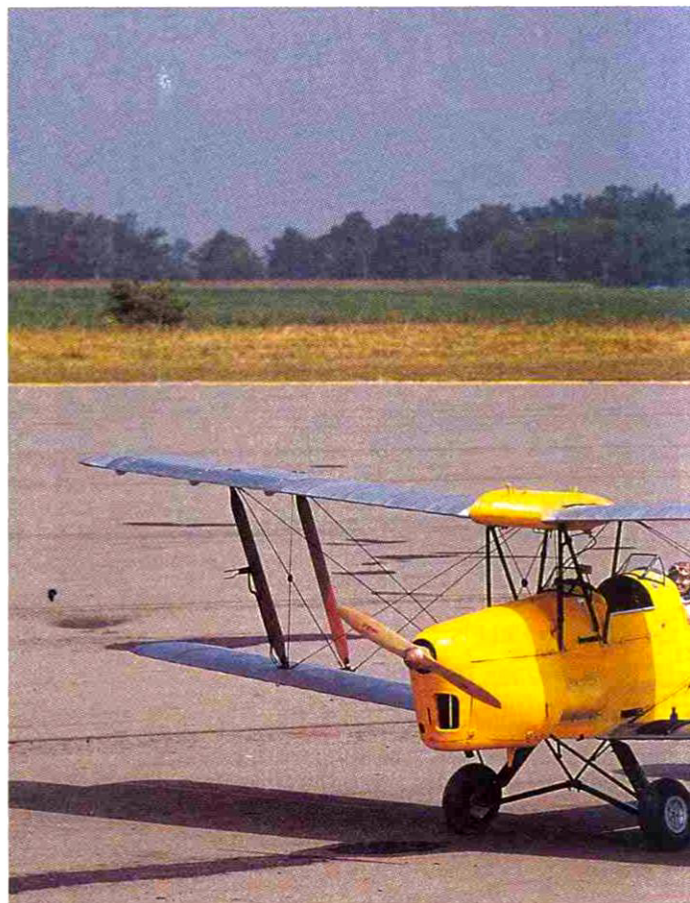
ROUND ONE

Perhaps round one began with something short of unbridled enthusiasm as the pilots learned that the three-man jury, composed of Tony Aarts of the Netherlands, Dennis Thompson of the United Kingdom, and George Buso of the United States, had ruled that the planes had to fly round one to be eligible for Static. As a result, there were some white knuckles on the transmitters during round one.

Peter McDermott's beautiful 1/4-scale Sopwith Triplane about to touch down. This very realistic flier has a wing span of 78 inches and weighs 15.4 lbs.

DÉJÀ VU

Monday morning greeted the early round-one arrivals with a slight ground fog and haze that nestled in the nooks and crannies of the lightly undulating countryside. Surrounding the AMA site



WORLD SCALE C



Above: opening ceremonies. Last flag to be raised is that of Uzbekistan. Touching moment as this represented the first time the new country's flag was raised at any event. (Flag was not ready for the Olympics.) Above left: overall individual winners at the awards banquet (left to right): 1st, Peter McDermott, United Kingdom; 2nd, Andreas Luthi, Switzerland; 3rd, Max Merckenschlager, Germany.



Left: Japan's Shuzo Yamamoto pushes his deHavilland 82A Tiger Moth back to the pits after scoring a 1,520 second-round flight. His 1/4-scale model weighs 15.2 pounds and is powered by an O.S. 120 4-stroke engine.



Left: Andreas Luthi is a schoolteacher who presented a 1/4-scale model of the Nieuport N-28 C-1 as flown in 1918. His 15.3-pound model is powered by an early O.S. 4-stroke engine and is covered with nylon. The model took four years and 2,700 hours to build. He even built special pinking shears to make the scale scallops on the covering. Andreas and his caller/mechanic were the only members of the Swiss team.



Above: Charles Levy, a banker from France, flew a 1935 Belgian version of an SV4C Stampe. Levy's 1/4-scale 15.2-pound Stampe is powered by an Enya 120 R 4-stroke. Left: Ronald Barr of Canada and his 1/4-scale, 13.2-pound, O.S. 91 Surpass-powered Pieterpol.

HAMPIONSHIPS

FAI WORLD CHAMPS

Max Merckenschlager, a German sales manager, prepared his 19.1-pound, 79-inch-span, Silesia-covered 1916 Albatros for a round-two flight. This 1:4.5 scale model is powered by a Laser engine using a muffler that Max designed and an 18x6 prop. Here, Max and friends are getting ultimate with the Albatros.



in the distance are sightings of old steam locomotives and barns. With early-morning flights of the Sopwiths, Nieuports, and Albatrosses, one felt transported back to a misty French countryside during WWI.

The seedings for the flight order had Yvon Mourier of France flying his Caudron Liciole as first up. Dave and Sally Brown, who managed the demanding, thankless flight-line operations so well throughout the event, made sure the proceedings started on time.

At the end of round one, flying only, with no static scores in, the team standings for the top three positions were: United Kingdom (4,403 points); South Africa (4,111); and Czechoslovakia (4,016). The United States could not be found in the top five.

The top three individual flight scores from round one belonged to Neil Allen of South Africa, flying his Nieuport 28, with 1,544 points; Mick Reeves of the United Kingdom, flying a Sopwith Strutter, with 1,520 points; and Switzerland's Andreas Luthi, flying his Nieuport N-28, with 1,503 points.

Team USA—manager Mike Stott, Kim Foster of Ohio, Bob Hanft of Alabama and Floridian Ray Torres—found itself perched in 7th place with 3,490 points, just ahead of the team from Japan. Kim Foster was up first for the United States, flying in slot five. While not a newcomer to scale competition, this was Kim's first experience in FAI scale. Assisted by his mechanic and caller Bob Campbell, Kim fired up his Nieuport 28 and took gracefully to the air. He scored 1,313 points for his first flight.

Up next for the USA was Ray Torres in slot 20. Ray is an FAI veteran, having represented his country in the 1988 championships in Gorizia, Italy, and the 1990



Those magnificent men and their flying machines from Team USA (left to right): Bob Hanft, team manager Mike Stott, Ray Torres and Kim Foster.



McDermott's Sopwith in flight.

Championships in Warsaw, Poland, where he placed 3rd. Ray chose to compete with a Cessna M 337 powered by two Enya .53 4-stroke engines. Much was expected from Ray and his mechanic/caller Ramon



Peter McDermott and his magnificent flying machine. His 78-inch-span, 1/4-scale, 1916 Sopwith Triplane weighs 15.4 pounds and is powered by a Laser 180 Twin that spins an 18x6 Dynathrust prop. Covering is silk over tissue. Peter, an air traffic controller, finished second overall in the 1988 and 1990 World Championships.



A fair dinkum group from Down Under (left to right): Noel Whitehead, James Brennan and Ron Erickson pose with Brennan's Grumman "Duck." When he isn't playing with Ducks, Brennan is a flight engineer with Ansett Australia Airlines.

THE "I THINK I CAN"

BETTY BOMBER

Torres (read: father). However, partway through their flight, on a low-altitude pass, considerable empennage flutter was detected, and Ray wisely aborted the remainder of the flight, thus scoring only 834 points.

Anchor for the United States, in slot 33, was handled by Bob Handft. Bob is a veteran of the previous three World Championships. He competed with a 1/4-scale version of a 1917 Fokker DR1 Triplane (read: go for bonus), powered by an O.S. 160 Gemini twin. He flew early Tuesday morning and earned 1,343 points for round one. Round-one flying was completed at 10:50 a.m. on Tuesday.

ROUND TWO

After the completion of round one, flying began immediately for round two. The day was clear with low humidity and mild temperatures. With pilots now a bit more relaxed, since they had gone through static, it was expected that a pecking order would begin to be established for potential final positions. Obviously, Team USA had a way to go if they hoped to finish in the top five.

In a spontaneous gesture of good sportsmanship, the gathering of pilots rewarded Ray with a thunderous round of applause as he touched down.

Max Merckenschlager of Germany put in a brilliant flight with his Laser-powered Albatros to lead all round-two fliers with a high of 1,731. Kim Foster spent the previous day studying the various flights and tried to determine what the judges were looking for as desirable characteristics. He flew accordingly and was rewarded with a 1,525. Robert Hanft, competitor that he is, steadied through with a 1,610.

But the excitement and anxiety in round two was provided when Ray Torres was up to fly. With no chance of a test flight and little time before the next round, the only thing Ray thought he could try was to change the brand of servos on the rudders and elevator and hope that this would cure his flutter problems. When Ray and his father took off, almost all the FAI pilots gathered at the flight line to see his efforts. Everyone knew that if the flutter problem was still an issue, the United States would have no hope as a team. Evidently, the moon was in the right

Two cardboard boxes, each small enough to be carried under your arm and able to be placed in the overhead luggage compartments of an airplane, traveled 17 hours from Japan to Muncie with Toshio Furuta. The 51-year-old Mr. Furuta, a missile project engineer with Mitsubishi Heavy Industries, arrived to represent Japan as a team member in the FAI-F4C Scale World Championships. Obviously, the two boxes contained his flight tools and line supplies, right? Wrong! They contained his airplane!

Furuta's airplane is a 1/12-scale, 14.6-pound model of the Mitsubishi Attack Bomber ("Betty") with an 82-inch wingspan. The model's fuselage was in several sections, as were the wings. Parts and linkages were in neatly packed and categorized plastic bags. It had to be seen to be believed. It took Mr. Furuta three days of effort to reassemble all parts into the reality of his Betty bomber.

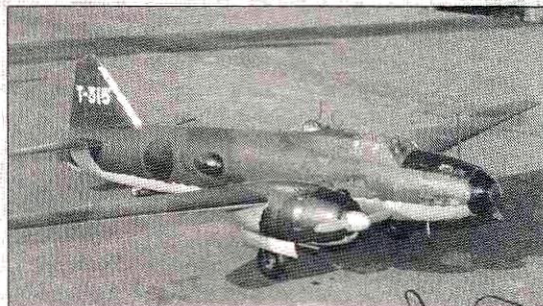
In slot 23, late Monday afternoon, the Betty took to the air for its round-one flight. Coming in for a landing, and trying to maintain realism of flight speed, it appeared that the plane stalled, snapped and spun into the runway. The plane began doing cartwheels and trashed itself into so many micro parts there weren't enough post-mortem clues to prove that a plane had previously existed. It was not a user friendly experience. "It's shrapnel," said AMA executive director Vince Mankowski. "It's in a million pieces and we'll need a vacuum cleaner to pick everything up." The end of the Betty bomber, right? Wrong!

These missile engineers are a hardy breed. Mr. Furuta worked all night and most of the next day, and somehow disciplined all the pieces to reincarnate a Betty bomber. When he carried his plane over for static judging the whole hanger-work-display area stood up as one and cheered.

He received 1,404 points for static score. With his crash, the first-round score was only 822 points. With the time-consuming rebuilding, he had to default round two. In round three, with a send off of voluminous applause from everyone on the flight line, the Betty went off into the blue. Mr. Furuta scored 1,137 points and with his week's Herculean effort somehow managed to place 26th overall. The Betty went home disassembled but intact in two small brown boxes.



Toshio Furuta and the "I think I can" Betty Bomber.



Furuta's 1/12 scale, after it had been totally demolished on its first flight—and totally rebuilt. The 81.9-inch-span plane is powered by two Enya .53 4-stroke engines and weighs 14.6 pounds.

FAI WORLD CHAMPS

place, as the team of Torres and Torres took to the air and put in a fantastic flutterless flight. In a spontaneous gesture of good sportsmanship, the gathering of pilots rewarded Ray with a thunderous round of applause as he touched down. He was also rewarded with a score of 1,699—the third-highest flight of round two. The second-highest went to Andreas Luthi, who was the entire Swiss team, with a score of 1700.

At the end of round two, and with static points included, the top three teams were United Kingdom, Germany and France. Team USA was nestled in eighth place, with a long way to go if they hoped to finish at least fifth.

ROUND THREE

One round to go. The FAI takes the two best flights of three, averages them, and adds the average to your static score, so there was hope that Team USA could advance in the final standings. (The scoring system would eliminate Ray Torres' aborted first-round flight.)

Wednesday started clear and sunny, but by early afternoon, the rain came and flying was suspended. Thursday dawned dark and dreary, but some early flights did take place. By late morning, the rain and wind arrived, and the jury canceled flying until Friday morning. By now, everyone was wondering whether round three would be completed.

Friday followed Thursday, as it usually does, but it dawned with a heavy overcast, low temperatures and winds gusting to well over 30mph. One was sure one would see Toto fly by on his non-stop return flight to Kansas, but the visibility wasn't that good. Flying was canceled for the morning.

The event director, Bob Underwood, called a meeting at 11:30 a.m. with the team captains and the jury. By meeting time, the winds were gusting at over 35mph, and it was decided to cancel flying for the day. It was agreed to start Saturday at 7:00 a.m. and try to complete round three. If round three couldn't be completed, the jury would determine final position by adding the static score to the best single-flight score, since everyone had at least two flights completed.

Saturday arrived clear but cold, with a temperature of 45 degrees Fahrenheit. Fortunately, it warmed up throughout the day and so did the flying. David and Sally Brown had the first flight in the air shortly after 7:00 a.m., and the final flight was completed at 3:35 p.m..

Round three saw the lads from the United Kingdom proving to one and all that the British had landed. The highest score of round three went to Peter McDermott with an 1,810. The second-highest flight score, 1,747, went to his colleague Mick Reeves.

Peter flew his 1/4-scale 1916 Sopwith Triplane, powered by a Laser 180 V-Twin. This is the airplane he used to place 2nd in both the 1988 and 1990 World Championships.

Mick Reeves competed with a model of the Sopwith 1 1/2 Strutter powered by a Laser 180 V-Twin. Mick enjoys the distinction of having been a contestant in every World Championship since its incep-

tion. He was World Champion in 1970 and 1978, second in 1982 and third in 1974 and 1980. He is truly a gentleman and a fine sportsman.

The third-highest score in this round went to Max Merckenschlager (1,715).

By now, Team USA was functioning like a well-oiled machine. However, when all the scores were totalled in the FAI format, they weren't to finish fifth. They finished second! Congratulations to Mike, Kim, Robert, Ray and their supporters, who never gave up. They were excellent sportsmen, good ambassadors and great competitors. This group truly represented the United States of America well. As Team USA stood on the awards stand, it was a proud and well-deserved moment for all concerned.

UNREALISTIC REALISM

The subject that seemed to come up more often than any other among the contestants was the "realism of flight" category. The strong feeling is that the way judges are interpreting and grading in this area is unrealistic and discriminates against most aircraft designed in the past 50 years or so. With respect to the model of the full-scale aircraft, Reynolds numbers don't scale accordingly, weights don't scale, power factors don't scale and speeds don't scale. Evidently, this area requires some attention if we are to keep vitality and technology alive and well in FAI F4C competition.

1992 SCALE WORLD CHAMPIONSHIPS

| Fin | Name | Country | Aircraft | Static | Flight | Total |
|-----|---------------------|---------|------------------|---------|---------|---------|
| 1 | Peter McDermott | GB | Sopwith Triplane | 1,864.5 | 1,721.0 | 3,585.5 |
| 2 | Andreas Luthi | SWI | Nieuport N-28 | 1,756.5 | 1,693.5 | 3,450.0 |
| 3 | Max Merckenschlager | GER | Albatros DVA | 1,726.5 | 1,723.0 | 3,449.5 |
| 4 | Mick Reeves | GB | Sopwith Strutter | 1,794.0 | 1,633.5 | 3,427.5 |
| 5 | Ray Torres | USA | Cessna O2A | 1,755.0 | 1,651.5 | 3,406.5 |
| 6 | Chris Foss | GB | Dalot | 1,673.0 | 1,561.0 | 3,234.0 |
| 7 | Charles Levy | FRA | Stampe | 1,719.0 | 1,440.0 | 3,159.0 |
| 8 | Jean Rousseau | FRA | Dewoitine | 1,670.5 | 1,453.5 | 3,124.0 |
| 9 | Robert Hanft | USA | Fokker DR1 | 1,570.5 | 1,531.0 | 3,101.5 |
| 10 | Juergen Steinberger | GER | Fokker DVII | 1,659.0 | 1,434.0 | 3,093.5 |
| 16 | Kim Foster | USA | Nieuport 28 | 1,385.0 | 1,534.0 | 2,919.0 |

TOP FIVE TEAM SCORES

| Fin. | Static | Flight | Overall |
|------|-------------|-------------|-------------|
| 1 | GB 5,331.5 | GB 4,915.5 | GB 10,247.0 |
| 2 | FRA 4,844.5 | USA 4,716.5 | USA 9,561.0 |
| 3 | GER 4,806.0 | GER 4,527.0 | GER 9,333.0 |
| 4 | CZE 4,794.5 | FRA 4,478.5 | FRA 9,273.0 |
| 5 | USA 4,710.5 | CZE 3,707.0 | CZE 8,417.5 |

POINT SPREAD

As was clear throughout the meet, the FAI bonus system remains controversial. There are diehard supporters on all sides—those who want the system to stay as it is, those who would like to eliminate the system and let the modelers' choice stand on its own wheels and those who feel that modifications are in order.

The consensus is that the rules shouldn't disqualify a model of any full-size aircraft from competing. There are changes proposed for 1994. Certain bonus points are to be reduced, some possibly removed and perhaps new restrictions added. If some proposed new rulings are added, Belgium's Phillip Avons, who won the two previous F4C World Championships, wouldn't be able to compete with his F-15 Eagle. Will these changes result in a plethora of new competitive designs or not? Time will tell.

GOODBYE FOR NOW

Language barriers didn't interfere with the warm, friendly relations that were quickly established and maintained throughout the contest. All thought the facilities were the best ever. Those who came left with warm memories. The event was well-run by the AMA. The 1992 R/C Scale World Championships were truly R/C bonding at its best.

Where do we go from here? Well, at least to the Netherlands, where the 1994 World Scale Championships will be held. Let's hope that the United States will be as well represented in the Netherlands as they were in Muncie.



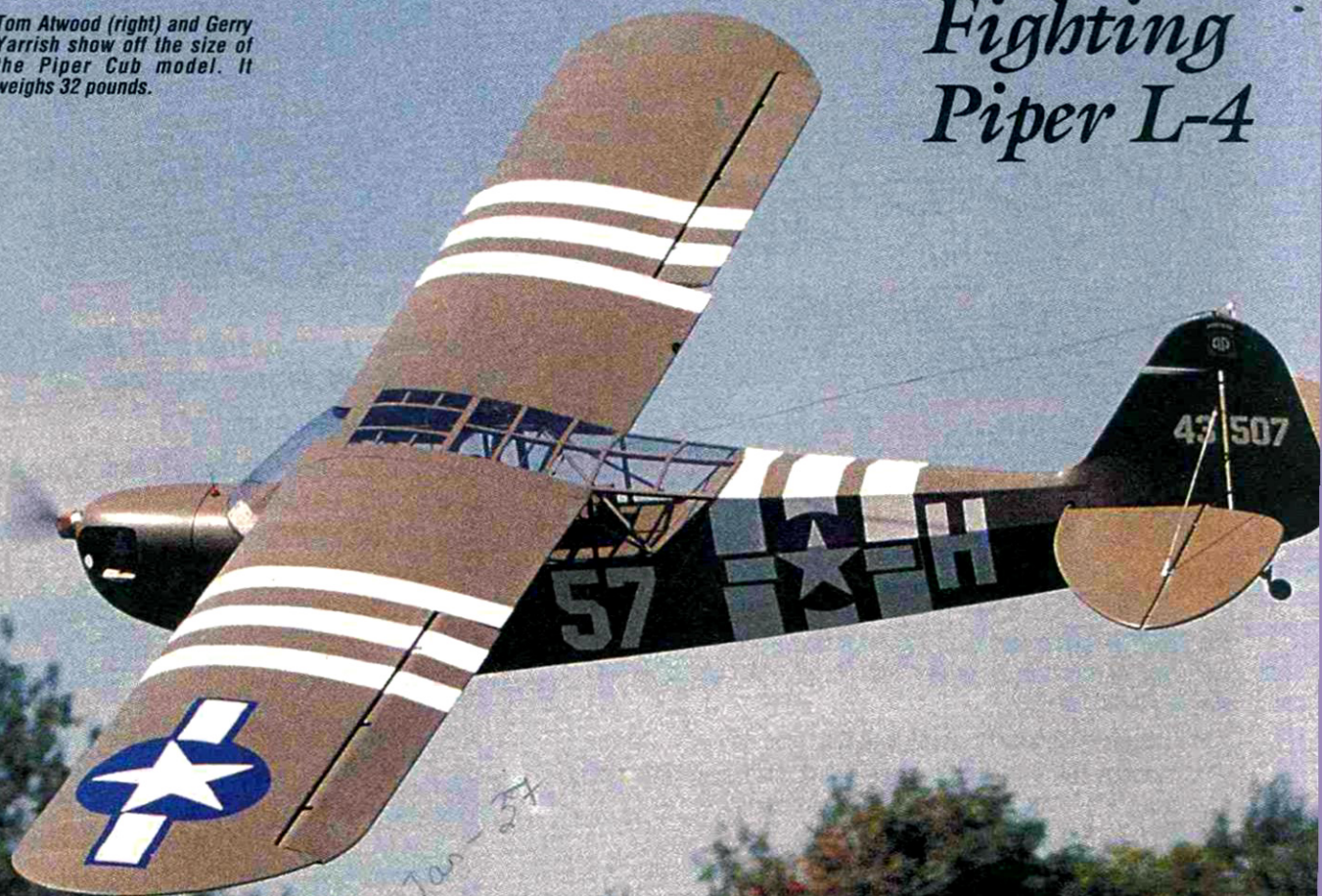
PHOTOS BY GERRY YARRISH, TOM ATWOOD & DAVE BARON

Tom Atwood (right) and Gerry Yarrish show off the size of the Piper Cub model. It weighs 32 pounds.



by GERRY YARRISH

Fighting Piper L-4

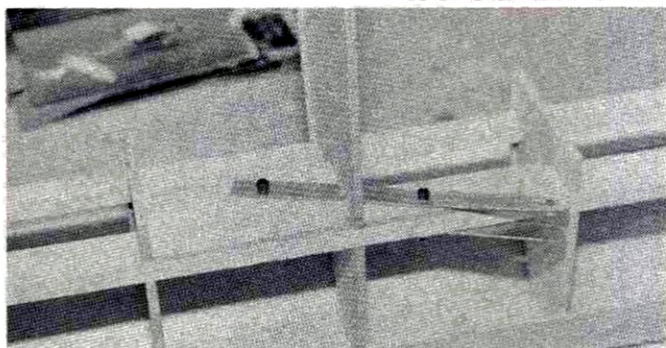
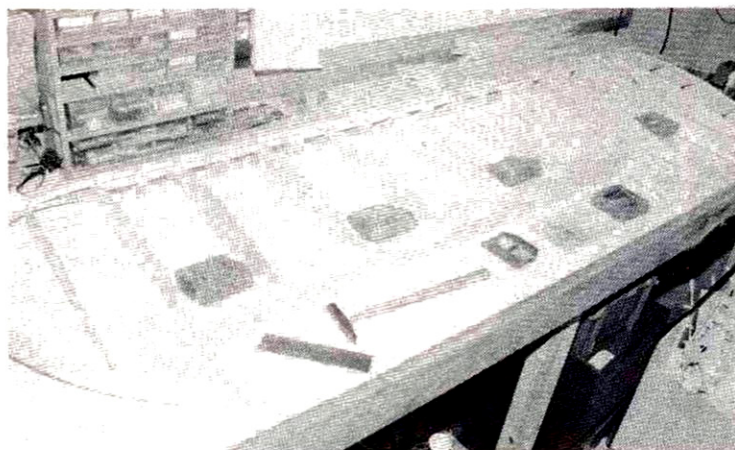


BALSA USA

1/3-scale

Cub

JUST A FEW YEARS ago, the average model on any flying field was in the .40 to .60 engine-size class. Models with wingspans of over 6 feet were considered big, and most of the big kits available were in this size range. The shift to large-scale models came slowly, but steadily, and now there's hardly a flying field without at least one 1/4-scale model in the pits. Canadian Bob Nelitz stunned the scale-modeling world in the '80s with a beautiful 1/3-scale Cub and won more trophies with it than can be numbered. Balsa USA[®] took the hint about large models long ago and has become well known for their big kits with reasonable prices. Their 1/3-scale, J-3 Piper Cub is an ideal choice for your first giant kit. It's relaxing to fly, and it can be a highly detailed, scale work of art.



Above: the wing-strut attachment straps are bolted through the spar and reinforced with plywood. Left: this is the finished, left wing panel ready to be lifted off the board.

FIGHTING CUB

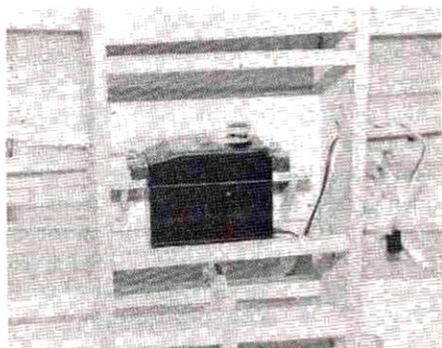
Just to be different, I decided not to paint my Cub the standard yellow color. While reading *Vintage Airplane* magazine, I found a beautiful flight-shot of an L-4 Grasshopper—the military version of the J-3. The aircraft, owned by David and Paula Henderson of Felton, DE, won the Reserve Grand Champion Antique award at the 1991 Sun N' Fun airshow in Florida. The beautifully restored L-4 was only a three-hour drive from my home. I contacted the Hendersons and made arrangements to photograph the plane and to interview its proud owners.

Having an actual aircraft to compare documentation to is the best situation for any scale modeler. The kit's plans show all the parts and details for the military version also.

CONSTRUCTION

The first thing to be built is the wing. The instruction booklet's photos and numbered steps were quite helpful. The two, full-length, $\frac{3}{8} \times \frac{3}{4}$ -inch spruce-stock main spars have no splices. The spars' tips are also tapered to simplify the wingtip construction. The die-cut ribs are of very good quality. On a few of my pieces, the ribs literally fell out of their sheets, and they could be used without sanding. The wingtip bows are laminations of $\frac{1}{8}$ -inch-thick lite-ply in the center with $\frac{1}{8}$ -inch-thick balsa on top and bottom. All the parts are die-cut, and they fit together nicely.

The innermost ribs are laminated to lite-ply doublers that stiffen the attachment points for the plug-in-type



The aileron servo has been installed in the wing root. Though the plans show no details, I made my removable servo mount out of plywood.

wing panels. The root ribs include two, $\frac{1}{4}$ -20 T-nuts for attachment to the upper cabin section. Two $\frac{3}{8}$ -inch-diameter hardwood dowels are used for alignment and to ensure correct incidence angle of the wings.

Balsa USA offers a separate kit that can be used to build scale Frieze ailerons similar to those on real J-3s. It includes full-size plans and all the wood and hardware to build them. They really add to the model's appearance, the extra work is worth it!

FUSELAGE

The fuse is built using truss construction, and uses $\frac{3}{8}$ -inch square balsa for the diagonals and spruce stock for the four main

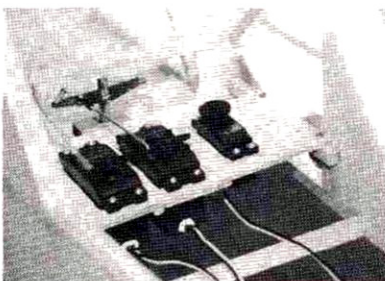
longerons. The body panels just under the windows made of $\frac{3}{8}$ -inch balsa sheet are already cut to shape. The top longerons, which lead from the wing's trailing edge to the tail, are spruce; the center, top longeron is split down the middle for part of its length to make it bend more easily.

All the parts fit together well and require little effort to assemble. The upper cabin has two main crosspieces that are made of $\frac{1}{4}$ -inch plywood. The forward crosspiece is attached to music-wire uprights. Metal tabs are soldered to the uprights and are screwed to the plywood. Rubber tubing is slid over the music-wire uprights to give them a larger-diameter, scale-size appearance.

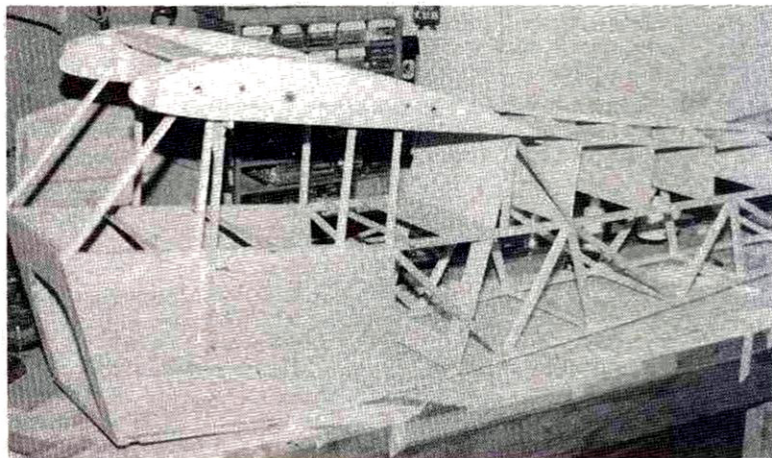
TAIL PARTS

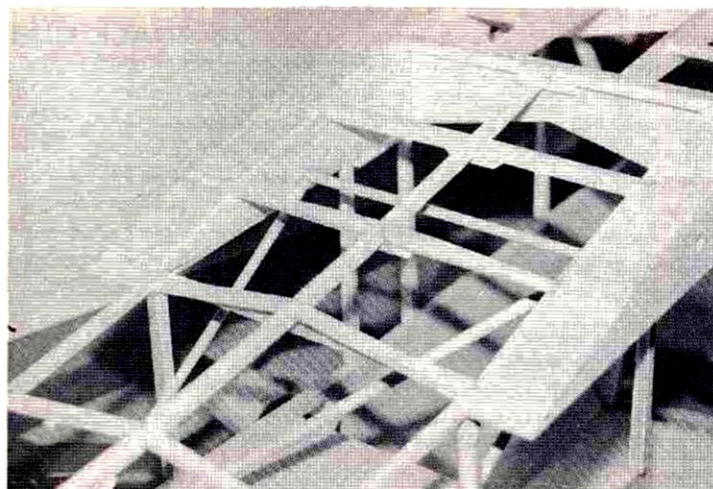
The outlines of the horizontal stab, vertical fin, elevators and rudder are laminated with lite-ply, much like the wingtips. The vertical fin is glued to the fuselage and the horizontal stab halves are attached in a scale fashion. Large-diameter brass tubes are mounted on the fuselage above the top longeron, and the stabs are slipped into them. A bolt holds each one in place and allows easy removal.

All the hinges in the kit are large, giant-scale Du-Bro plastic hinges with removable cotter pins. They're very strong and well-suited to a model this size, but I replaced

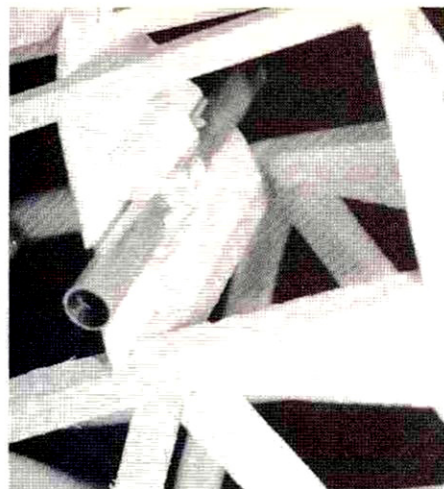


Above: the S-134 rudder and elevator servo installation are visible through the entry door. The servos are completely hidden from view by the rear seat. Right: the cabin top section is built separately and then added to the fuselage sides as a single unit along with the window frames.





Left: the stab's forward mounting tube is locked into place with spruce blocks and a 2-56 nut and bolt.



Far left: In the military version, the cabin top is covered with clear-plastic window sections. All the frames are made of spruce.

them with Robart's* large hinge points for what I considered to be a better scale appearance. Robart's hinge points are installed with Elmer's glue and they don't require cross-pinning.

BIG BANGER

For power, I decided to go with Indy R/C's* Zenoah G-62. Yes, the model could fly on a

G-38 or a similar engine, but I wanted added power in climb-outs.

The G-62 just fits within the cowl. A small opening was needed on the side of the cowl to clear the carb. The engine is soft-mounted with B&B Specialties* engine mount and Vibra-Loc system; the modified muffler (also from B&B) exits the bottom of the cowl. The engine is mounted without any side thrust or downthrust.

The linkage to the throttle is actuated through a 90-degree bellcrank, and it's attached to the carb with a threaded pushrod and a ball-link connector (all from B&B). The throttle servo is installed next to the fuel tank, and a Sullivan* metal cable attaches the servo to the bellcrank. The fuel tank is suspended under the plywood shelf, behind the firewall, with rubber bands and metal hooks.

It's important to drill the firewall and mount your blind nuts for the engine mount bolts before you attach the forward, upper plywood deck. Once the cowl is in place, you lose access to the two, upper engine-mounting bolts. I cut an access hole (which is hidden from view by the engine cowl) in the upper deck to gain access to the upper mounting bolts.

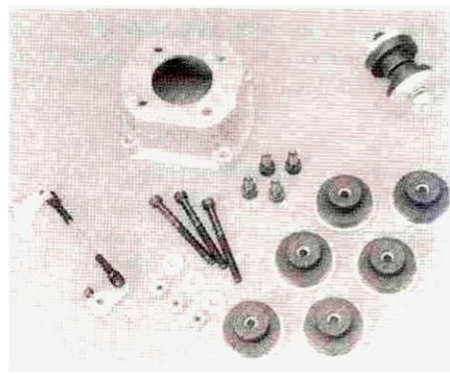
LANDING GEAR

One of the kit's highlights is the main gear's metal-tube construction. It's accurate in scale appearance and it includes functional

bungee-cord shock-absorption. For this critical part, I recruited friend Russ Pribanic's help. Russ works wonders with metal, and he did a professional job of silver-soldering all the parts together, holding them in a plywood alignment jig. It's important to use good quality silver solder for the joints. Hobby-grade silver solder isn't strong enough, and it will break under the stresses imposed by this model.

NOSE JOB

The plastic cowl supplied with the kit is the only thing I thought I had to replace. It's vacu-formed, and wasn't up to the quality of the rest of the kit. I took the quick way out



This is what's needed to mount your G-62 to your model. The aluminum mounting flange, throttle linkage, Vibra-Loc soft mounts and nuts and bolts are from B&B Specialties.

and ordered a beautiful replacement cowl from Fiberglass Master*. This replacement fits perfectly without trimming, and it's much more durable than the original.

RADIO

I use the Ace* MicroPro 8000 radio; each aileron is on a separate channel. The two channels are mixed, and this gives some redundancy to the system. Ace has adapters for different servos; the ones for my Futaba S-134s were a perfect match, so I didn't have to cut and solder servo leads.

SPECIFICATIONS

Type: Giant scale
Wingspan: 140.75 inches
Wing chord: 21 inches
Length: 73 inches
Weight: 32 pounds
Wing area: Approximately 2,950 square inches
Wing loading: 24.9 ounces per square foot
No. of channels req'd: 4 (aileron, elevator, rudder, throttle)
Airfoil: Flat bottom
Wing construction: Built-up wood with two, spruce main spars
Kit construction: Built-up, traditional stick construction, spruce longerons with balsa vertical members
Washout built in: No, but the wing can be adjusted with its lift-struts for washout
Engine used: Zenoah G-62
Suggested engine range: 2 to 4 cubic inches
Props used: wooden Zinger, 24x10 and 24x8
Sug. retail price: \$439.95

Features: the kit has almost everything you could want: wheels; fuel tank; tail wheel and tail-wheel assembly; vacu-formed, plastic engine cowl; aluminum-sheet material; scale-size screws, nuts, bolts, washers and cowl clips; traditional balsa-and-plywood construction; spruce main spars and fuselage longerons; plastic cockpit detail kit, including seats and floorboards; scale articulated landing gear with functional bungee-cord shock absorbers; metal fittings; hardware; and clear-plastic window material. Some nice touches: pinking tape for rib-stitching detail and punched-aluminum instrument panel.

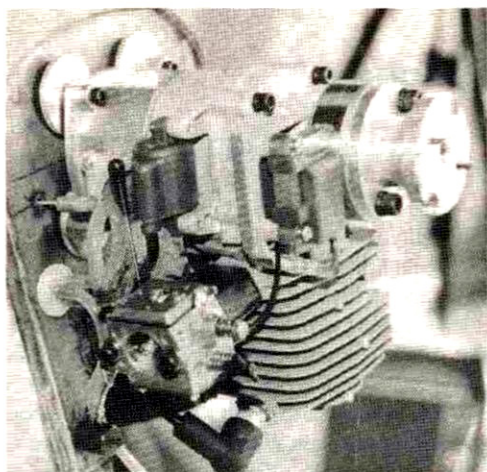
Comments: the kit has all the information and drawings necessary to build a standard J-3, a clipped-wing Cub or the L-4 military version. The plans are very good, and the instruction booklet points out some possible pitfalls.

Hits

- Good plans and photo-illustrated instructions
- Accurate, band-sawn, plywood parts
- Good die-cut formers and ribs
- Excellent flight performance

Misses

- The vacu-formed engine cowl isn't up to the same standard as the rest of the kit.
- Very little information on radio installation



The Zenoah G-62 fits the cowl tightly, but nicely. The fuel lines exit the firewall through a second fuel-tank stopper for a neat installation.

COVERING

I covered the model with 1.6-ounce Dacron from Wicks Aircraft Supply*, and I used Poly Tack fabric adhesive to attach the material. When attaching this material, you must first apply the adhesive to the structure. This reduces weight because glue is used only where the cloth touches wood. Apply the material as you would any other cloth covering. The biggest difference in using this material is that instead of using your iron to bond it to the wood, you brush acetone through the cloth to activate the glue. After this has been done, shrink out all the wrinkles with your iron or heat gun. The material will shrink about 25 percent, so be careful not to overdo it. After all the wrinkles have disappeared, repeat the acetone treatment on all the wood touching the cloth. You'll be truly amazed at how well this technique works.

I did the L-4 version, which has a lot of glass area; only a portion of the aft fuselage needs to be fabric-covered. Cover both the aft fuselage and the vertical fin with the same piece of material. This requires that the seam be placed along the top center of the fuse, but it's covered with pinking tape, so placing it on top isn't a problem. The forward section of the fuse (from the windshield to the firewall) is covered with aluminum sheeting, so all that's needed is for the wood to be sealed with the Poly Tack and then attached the aluminum sheeting with a good contact cement.

TAPES AND STITCHES

The kit comes with five rolls of pinking tape to replicate the rib-stitching detail of the full-size aircraft. The method shown in the instructions works very well and can be done quickly. I used the bristles from an old paintbrush and cut them into 1/4-inch lengths. These pieces are stuck to the sticky side of the pinking tape in the correct scale spacing, and then the tape is applied to the covering. When the tape is sealed to the surface with primer, it looks true to scale and improves the model's appearance.

THE RELIGION OF CUB-ISM

It would be impossible to discuss light planes or general aviation without the Piper Cub entering into the conversation. The term "Cub"—in the minds of many—has become a generic one that's used to describe any small, fabric-covered plane.

William Piper

is perhaps one of the best-known people in general aviation. This line of aircraft started in 1931 with the partnership of Piper and C.G. Taylor, when they created the Taylor E-2 Cub.

Today's Piper J-3 enthusiasts show as much allegiance to it as the followers of a cult. The search for information, aircraft parts and documentation has reached a fevered pitch. I was privileged to go to the "holy shrine of 'CUBism'" to meet the high priest of the religion. I went to a mecca called The Henderson Air Ranch.

On a small, out-of-the-way airstrip, in Felton, DE, I met David and Paula Henderson, who have been restoring and rebuilding full-size Cubs as a full-time occupation (or is it an obsession?) for over six years. The Hendersons have rebuilt over 30 pristine Cubs and L-4s; many have found their way to Oshkosh, where they earned top awards.

When I was given a tour of their facility, I thought I had died and gone to Cub heaven. No less than 10 J-3s and two L-4s were being lovingly rebuilt to exacting standards. Inside and out, the planes were perfect.

In the far corner was J-3, N1776—probably the most famous J-3 ever built. It was originally built to raise funds for the RAF's Benevolent Fund. Orville Wright once flew it, and in the early '70s, President Nixon wanted to buy it, but Tricky Dick didn't get his wish. The plane changed hands many times before Dave bought it from its last owner in Roxbury, CT. (That's where we test-flew our model.) Surely, the Henderson's Cub nest can be considered a museum. They're the world's most prolific restorers of J-3s and L-4s.

Dave will build a Cub or L-4 for you from the ground up for between \$28,000 and \$35,000, depending on its degree of perfection. The waiting list, by the way, is 14 months long, and it will take another 14 months for your Cub to be completed. Dave is an A&P mechanic, and he does all the annual inspections and engine work for his customers. If you want to own a Cub and become a Henderson disciple, you can reach Dave and Paula at the Henderson Air Camp, RD 3, Box 10, Felton, DE 19943; (302) 284-8107.



Dave Henderson shows off his next L-4 restoration project.



When you enter Dave's workshop, you will think you went to Cub heaven.

FLIGHT PERFORMANCE

TEST PILOT, DAVID C. BARON

• Test flight

Given that this plane is more underweight than overpowered, I expected the test flight to be comfortable and flawless; it was. The trims were close to perfect. With the G-62 engine, full-throttle takeoffs are more akin to those of a Maule Rocket, but this can be a real asset when getting out of trouble, or when flying from smaller fields that are "tight" for giant aircraft. Test-flight location was a full-scale grass runway.

The best word to describe the model is "majestic." Just lil full-scale plane, elevator trim changes with throttle setting—drastic change, but realistic nose-dropping with power red and an energetic climb with higher throttle settings.

• Launching/takeoffs/climb-outs/approaches/landings

During any power-off situation, the plane's tremendous frontal area caused the J-3 to decelerate rapidly and descend. All approaches and landings were made with some power to allow a normal flare. Nothing is wrong with this; it means that the aircraft's wing loading and total weight are so low that there isn't enough mass and inertia to overcome its drag. A few words of caution: dead-stick landings may not get back to the field if the aircraft is downwind when the engine takes a break. Believe it or not, using this aircraft in competition may require that you add 10 or more pounds! This plane should be landed with a little throttle to prevent it from being overcome by its own (lack of) inertia. Once you've mastered the rudder, side slips look best on a Cub.

On touchdown, as soon as flying speed has gone, get the tail down and hold it there with full up-elevator, because the rudder will work against you if there's any crosswind.

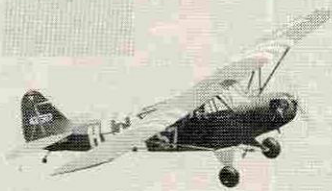
• Low-speed stalls

Using the ailerons instead of the rudder in stalls or slow flight will get you into trouble. Coordinated rudder use is mandatory whenever you slow them down. Coupled rudder and ailerons can help, but when the Cub finally gets into a stall, only rudder will save it from a cartwheel if it's close to the ground.

Ailerons increase the angle of attack of the wing that's already stalled and will cause it to drop faster. To compound the problem, the plane will also yaw in that direction because of the increased drag of the aileron that's down. The aileron on the other side of the wing reduces the drag on its side as well. In small models as well as in giant ones, this is the recipe for a stall-spin disaster. The moral of the story is: practice your stalls at safe altitudes, and use only the rudder to maintain heading through the stall and to recover from unwanted turns.

• Aerobatics

Loops, wing-overs and barrel rolls demand careful flight-speed manipulation. If you let this Cub slow down too much, it will fall out of maneuvers. At full throttle, this would be less of an issue, but it also wouldn't exhibit realistic maneuvers. Overall, this plane's performance comes as close to flying a full-scale J-3 as you could ever dream. I've been fortunate to have many hours flying a full-size "civilian" L-4, and I was awed by how closely the model's performance matched that of the full-size version.

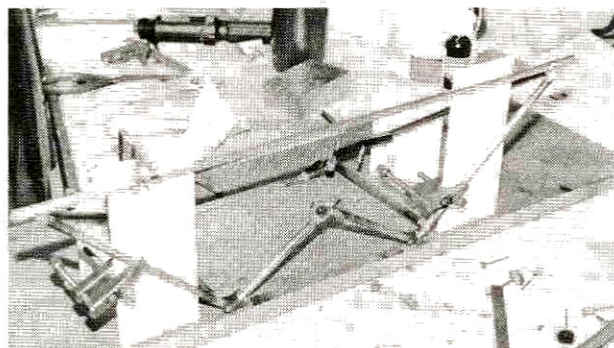


1/3-SCALE CUB

DETAILING AND PAINTING

With a medium touch-up gun, I sprayed Benjamin Moore satin, exterior-grade, latex house paint on for the finish. Roy Vaillancourt of Vailly Aviation*, has used this finishing technique on his 1/4-scale Stinson L-5s for a long time. By taking your color chips to a hardware store that has a computer-controlled, color-matching machine, you can get all the military-color paint you want in satin, semi-gloss, or glossy finish. I bought my paint from Roy.

The paint is mixed with 25 percent water and uses about 40psi air pressure. Several light coats are applied; it helps to use a hot-air gun to set each coat before the next is applied. A



A jig is supplied with the kit so that you can accurately assemble the landing gear. A long brass tube holds the axles in alignment.

quart can is enough to paint the entire model. For finer painting such as the camouflage demarcation lines along the leading edge of the wing and the window frames, I used a Badger* Model 150 airbrush with a heavy paint tip. The paint is mixed with about 35 percent water when used with the airbrush. The interior was brush-painted with paint straight out of the can.

MARKINGS

The star and bars are very thin, Mylar decals that I ordered from a local sign shop. They cut the graphics using my templates, and the results are very good. This material is about .002 inch thick—thinner than a coat of paint. To make the Mylar lie smoothly over the ribs and stringers, I softened it with a hot-air gun and rubbed it down into place. The finer graphics, such as the stenciling and the 82nd Airborne decals on the rudder, are rub-on, dry transfers from Aerofoil Designs*. To get the markings that you want, you must supply this company with all the information you can regarding color, size and shape. Once you've done your homework, they'll hand-screen the marking. All that's required after the markings have been applied is to seal them into place with a suitable clear coat.

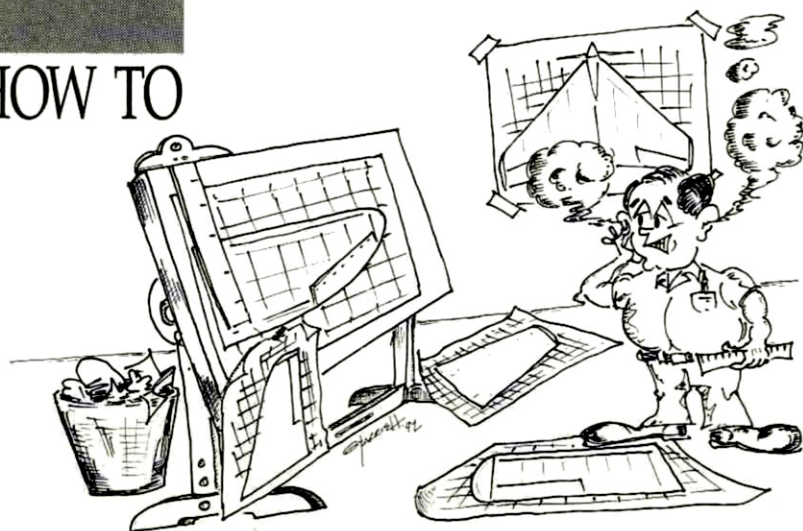
With such a large cabin, it would be a sin not to have a pilot figure. My intrepid aviator comes from Officers and Gentlemen* and was painted with acrylic craft paint. Combined with all the fine details in the cabin, the scale effect is striking. The finishing touch was a scale tailwheel assembly from Scale Aviation* complete with chains, springs and cast wheel yoke.

AT THE STRIP

Getting this monster to the field is a real chore; find a friend with a truck. At the field, it takes about 20 minutes to assem-

(Continued on page 73)

HOW TO



A look at the fundamentals

Wing Design, Part 1

by ANDY LENNON

THE SWIFT'S DESIGN is the central theme in this series of articles. It has been flying for several months and its performance has lived up to expectations.

It weighs 92 ounces fueled, has 600 square inches of wing area (4.17 square feet), an aspect ratio of 6.3 and is powered by an O.S. Max 0.46 SF engine rotating 10 inches diameter by 9 inches pitch (or 10 inches diameter x 10 inches pitch) APC props. Its top speed is 100mph, and flaps fully extended, it will stall at 18mph. Its wing loading is 22 ounces per square foot, and its power loading is 200 ounces per cubic inch of engine displacement.

A detailed analysis of the Swift's weight

of 92 ounces reveals that 46.5 ounces (or 50.4 percent) of that weight can be classified as "fixed." This is weight over which its designer has no control. It consists of:

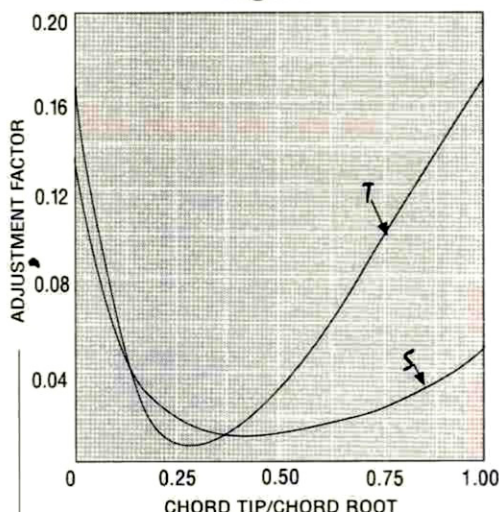
- Power unit—spinner, prop, engine, muffler, cowling, tank and fuel;
- Control unit—receiver (6-channel), battery (700mAh), five servos, an on/off switch, and foam shock insulation;
- Landing gear—tricycle with 2-inch-diameter wheels.

The remaining weight of 45.5 ounces (or 49.6 percent of the gross) is composed of wing, fuselage and tail surfaces. This portion is *under the control* of the designer.

The wing loading he selects will dictate the wing's area, and generally, the size of fuselage and tail surfaces. It will also influence the structure; lower wing loadings and lower speeds reduce flight loads, particularly those due to centrifugal force, permitting lighter, less rugged structural design.

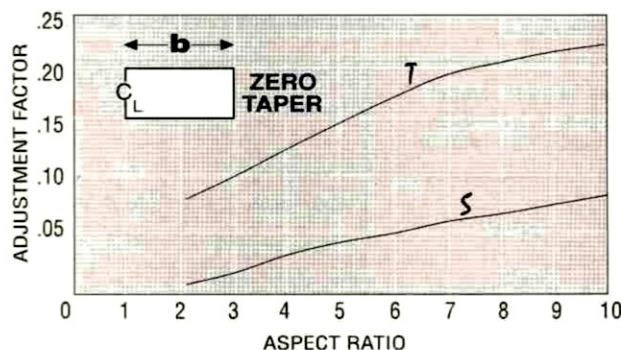
It's possible to design a model of 800 square inches of wing area (5.56 square feet) with the same gross weight as the Swift by use of a more open structure. This model would have a lower wing

Figure 2



Straight-wing correction factor for non-elliptic lift distribution.

Figure 1



Tapered-wing correction factor for non-elliptic lift distribution.

loading of 16.5 ounces per square foot and would stall at 18mph.

Thus, flaps for landing wouldn't be needed. The weight of the fifth (flap) servo; the additional weight of the 700mAh battery (versus 500mAh); and the additional weight of the flaps, their hinging and their actuation would all be "saved." However, the performance of this model would not be as good as the Swift's, largely owing to the increased total drag resulting from its larger size.

The point of all this is that the type of performance desired by the designer dictates the wing loading and, to a large extent, the structure. For the Swift, high speed and maneuverability were the objectives, calling for a rugged, stress-skinned and low-drag design. Thus, within reasonable limits, wing loading governs performance and structural design.

(Continued on page 46)

New Giant Scale TR-260+ Pre-Built

(All wood—no foam)



John Eaton's
TR-260+
List price: \$895
Intro price: \$595

Fully Aerobatic laser-type hand-built in Thailand of balsa and ply. Covered in two-tone Ultracote. ABS cowl, hatch cover and wheel pants. Fiberglass options and full replacement parts available. Excellent slow-flight characteristics.

Wingspan: 92" Length: 65"
Weight: 16-19lbs. Power: 2-4ci

S&H \$20 (COD add \$5; CA res. add 8.25% tax).
Address for J&K Products listed below.

New Giant Scale TR-260 Kit



John Eaton's
TR-260
List price: \$325
Intro price: \$249

Kit version of the pre-built. Aerobatic laser-type mid-wing with symmetrical airfoil. Kit includes full-size plans, gear, canopy, ABS cowl, hatch cover and wheel pants. All parts die-cut balsa and ply (no foam). Fiberglass options, accessories and full replacement parts available. Excellent slow-flight characteristics.

Wingspan: 90" Length: 65"
Weight: 15-18lbs. Power: 2-4ci

S&H \$20 (COD add \$5; CA res. add 8.25% tax).
Address for J&K Products listed below.

New Giant Scale P-51 Kit



John Eaton's
P-51
List price: \$795
Intro price: \$500

True-scale and Reno-Race legal! Three-time winner as Miss America no. 52. The second in Bronze at Reno Unlimited; best in Stand-off Scale at Las Vegas QSAA; first place in Pylon Racer at IMS. Foam-and-balsa wing, carbon-fiber-reinforced spar and fiberglass fuse. Accessories available including scale wheels, struts and retracts.

Wing Span: 101" Length: 84"
Weight: 30-35lbs. Power: 4.2-5.8ci

S&H \$50 (COD add \$5; CA res. add 8.25% tax).
Address for J&K Products listed below.

J&K Products (A division of Model Center)
3062 Golden Ave.
Long Beach, CA 90806 (310) 426-8085
(Check, money order, or COD only.)

WING DESIGN, PART 1



The Swift on a landing approach

WEIGHT ESTIMATING

Having selected the power and control units and type of landing gear, it isn't difficult to closely estimate their *fixed* weights.

Similarly, having decided on the wing loading, the *variable* weight of wings, tail surfaces and fuselage may be estimated with reasonable accuracy. My own estimates have only rarely been "right on"; the tendency was to underestimate. In compensation, the Swift's gross was overestimated at 100 ounces, whereas the actual is 92 ounces—8 ounces difference. While not perfect, this rational but practical approach shouldn't result in a difference between the estimate and actual of more than 10 percent.

With weight estimates of both fixed and variable components achieved, and the wing loading selected, the wing area is easily calculated.

$$\begin{aligned} \text{Wing area in sq. in.} &= \\ &\frac{\text{Weight in oz.} \times 144}{\text{Wing loading in oz. per sq.ft.}} \end{aligned}$$

WING DESIGN VARIABLES

These each require decisions:

- Airfoil selection
- Wing planform
- Aspect ratio
- Stall patterns, lift distribution and stall avoidance
- Wing tip design
- Flaps

To aid in decision making, each of these variables will be discussed in some detail, except airfoil selection, which was covered in the May and June '92 issues of *Model Airplane News*.

It's useful at the initial stages of a new design to have a preliminary estimate of the new model's total weight and wing area. In Part II of "Stressed Skin Design," the weight versus wing area of 14 models was analyzed

In full-scale airplanes, modest sweep forward moves the wings' main spar aft, out of the way, and improves the pilot's forward and downward vision.

(*Model Airplane News*, October '92). This disclosed a surprising consistency in the weight versus area relationship of 0.1565 ounces per square inch—or 22.5 ounces per square foot. For those adopting stressed-skin construction, these figures provide an easy weight-estimate basis.

For others who prefer lighter, more open structures, a study of construction articles in *Model Airplane News* and other modeling publications will help. There's much information, in detail, therein. Still more will be found in *Model Airplane News's* "Field & Bench" reviews and product reviews published elsewhere.

A word on tank size. It makes no sense to provide a 16-ounce fuel tank on a model powered by a 0.40 to 0.50cid engine. Most sport flights seldom last more than 25 minutes so, on landing, the 16-ounce tank is still half-full. Your model is penalized to about half a pound carrying this useless weight. A guide to tank size relative to engine displacement is 20 ounces per cubic inch of engine displacement. Thus, for a 0.40 engine, an 8-ounce tank is right on.

Now, let's consider the many other design decisions to be made. It's fun!

(Continued on page 72)



by J E F R A S K I N



THOSE INCREDIBLE GEE BEES

Subject: History and times of the famous planes of the Granville Brothers

Source: Studio 16, 16 Ridgewood Terrace, Springfield, MA 01105

Summary: Historically accurate, exciting footage, a must-see

List Price: \$24.95 (plus \$3.00 for shipping and handling)

Length: 57 minutes

The Golden Age of Aviation produced a large percentage of the most famous aviators and aircraft of all time. Outstanding for their speed, aerodynamic innovation, and characteristic barrel-shaped fuselages were the Gee Bees. They and the men who designed and flew them are the subjects of this video.

Fascinating from beginning to end, including the interviews with surviving Granvilles and their associates, this tape dispels the notion that the planes were inherently flawed as some have suggested. This is no whitewash, since many recent studies and test flights with full-size and R/C replicas of the Gee Bee aircraft have shown that they flew very well.

This fine tape will have an honored place on my video shelf. You should consider it for yours.



TOP GUN TOURNAMENT 1992

Subject: The prestigious all-scale invitational, narrated by Frank Tiano

Source: Propwash Video Productions, 2973 Berman Street, Las Vegas, NV 89109

Summary: Stupendous, stunning, incredibly detailed, well-flown scale models

List price: \$26.95 (plus \$3.25 for shipping and handling)

Length: 111 minutes

Top Gun is one of our premier R/C scale events, in spite of a name that sounds like a combat contest. Held at a plush setting in West Palm Beach, FL, the quality of the building and flying must be seen to be believed. Occasionally, there is no way to tell that you are watching a model.

For example, we often see landing-gear suspensions so finely tuned that the planes seem to weigh a few tons rather than a few pounds as they trundle realistically across the grass. Many of the pilots skillfully fly the large, open maneuvers characteristic of the planes being modeled. There is no higher art in modeling than flying an accurate representation of a full-scale craft just the way the prototype flew.

Besides the scale models, the video—narrated by event organizer and expert modeler Frank Tiano—shows exciting formation flying, incredible helicopter aerobatics, an R/C plane dropping a horde of individually operated R/C parasailers, modeling's first commercially available real turbine engine, and more.

In contrast to the meticulous preparation of the models, the tape is a casual view of the competition, more an informal walking tour than an overproduced network extravaganza. Here and there cuts from one scene to another are made in the middle of a word, and the absence of fill lights or reflectors left some faces obscured in the shadows of their baseball cap visors. The tape gets kudos for not having distracting background music—the producers wisely realize that the sounds of aircraft motors and experts discussing their craft cannot be improved upon. I may have gotten an early copy since it didn't have the write-protect tab removed. If yours comes this way, break off the little rectangular plastic tab on the back of the cassette so that you don't find a rerun of *Leave it to Beaver* accidentally recorded over it.

I enjoyed the many well-shot details that showed the precision with which master builders

(Continued on page 73)

REMOVE BEFORE FLIGHT

REMOVE BEFORE FLIGHT

Sport Flyers Association

800-745-3597

4145 Travis, Ste.202, Dallas, TX 75204

Membership Application Fax 214-522-0868

SAFETY CODE COMPLIANCE AND WAIVER STATEMENT

I will comply with the SFA Safety Code and my Flying Site Safety Code for all model aircraft operations and the NAR Safety Code(s) for all sport rocket operations including any changes or additions which may occur during my membership period. I understand that my failure to comply with the codes will result in loss of liability coverage for any damages or claim. I understand that written notice must be provided immediately upon the occurrence of any incident of bodily injury and/or property damage. I also understand that no claim will be accepted sixty (60) days after the expiration of my policy. I hold harmless the Sport Flyers Association, Incorporated trade membership organization for any personal injury, property damage or wrongful death which may occur. Current membership and coverage effective January 1, 1993 to December 31, 1993.

MUST BE SIGNED BELOW FOR ACCEPTANCE

X

Applicant or Parent/Guardian of Applicant under sixteen years of age

SPORT FLYERS ASSOCIATION SAFETY CODE

- I will not deliberately fly my model aircraft over spectators.
- I will not fly my models in the presence of spectators until I have learned to fly safely.
- I will not use metal propellers.
- I will not buzz, tail or harass any aircraft, car, animal, or any object in the air or on the ground.
- I will test fly any new or repaired aircraft before flying in the presence of spectators.
- I will abide by all safety rules established at any field where I fly and any state or local regulations governing model flying. I will always obtain prior permission from property owners before flying. I will not fly any models in a careless, reckless or dangerous manner.
- I will not use hazardous fuels nor fuels containing tetranitromethane or hydrazine.
- I will not use any explosives in conjunction with model flying whether on the model, in the air, or on the ground. Rockets will be flown in accordance with the Safety Code(s) of the National Association of Rocketry. A fire extinguisher must be present when using pyrotechnic smoke candles. Authorization may be secured from the SFA for special events.
- I will not power my models with turbojet engines unless I have been certified to do so by the SFA, an SFA approved flight school, or an SFA approved manufacturer's program.
- I will not fly my model higher than 400 feet unless it is flown in uncontrolled airspace, or unless it is a sport rocket flown in accordance with the Safety Code(s) of the National Association of Rocketry.
- I will not fly my model aircraft within three miles of any airport unless I have received permission from the airport operator or authority, or I am flying at an authorized radio control flying site.
- I will always perform a ground check of my model before flight.
- I will use only those radio control frequencies currently allowed by the Federal Communication Commission.
- I will extinguish any fuses on my Free Flight model upon completion of function.
- I will only launch Free Flight models at least 100 feet downwind of spectators, cars, or anyone not directly involved with the flight.
- I understand that SFA insurance does not cover activities related to the flying of Control Line models.
- I will retrieve any lost models with great caution, considering all circumstances thoroughly before proceeding, and will never attempt to recover a model from a power line.
- I will not prop or adjust my model aircraft engine with an unprotected hand.
- The weight limit and size of my aircraft will be in accordance with the local and national rules of the FAA and/or the QSA, and those rules which apply at clubs which have special SFA policies which exceed the coverages provided in the SFA Master Policy.

☐ New ☐ Renewal

SFA Number

NAME (PLEASE PRINT)

ADDRESS

CITY / STATE / ZIP

CHECK ENCLOSED

- ☐ \$25 Adult ☐ \$15 Youth ☐ \$2 Optional Medical to \$25,000
☐ VISA ☐ MASTERCARD Exp. Date

CARD NUMBER

Sign Here For Credit Card

THE ACE* EASY EAGLE is a versatile, smooth-flying advanced trainer and introductory competition sailplane. This Harley Michaelis design adds several improvements to existing 2-meter balsa and plywood sailplane kits, including an airfoil that really flies well (the ribs are cut to an SD-7032), flaps and a new type of gapless hinge. The result is a model that has the best speed range of any 2-meter, open-bay, balsa-rib glider I've flown to date. I've spent nearly a year with this airplane (it's one of 20 sailplanes I've built and flown), and it has produced many smiles and only a few frowns. Let me tell you the story.

KIT CONTENTS

The kit includes a die-cut light plywood fuselage, bulkheads and balsa ribs; machine-cut shear webs; wing joiner parts and a hatch; plus balsa-strip stock. The nose block is drilled for ballast and the leading-edge stock is pre-shaped to save building time. Pushrods are included and the hardware package is complete, including a tow hook. I added only an antenna lead out tube. Ace R/C and Easy Eagle logotype decals are provided.

The full-size blue-line plans provided were clear and complete. The 12-page assembly manual, written for beginners, renders detailed building instructions and is illustrated with 36 photographs and two diagrams. The wood was of average quality; some of the die-cutting was good, and some had crushed edges; and the printed materials were above average.

ACE R/C

Easy Eagle

by DAVID D. GARWOOD

AN ADVANCE IN ITS CLASS



FINALLY...TAKE THE FEAR OUT OF FLYING TWINS!



NOW with the new Safety Sync, any pilot can safely enjoy the thrill of flying a twin.

The major problem with any twin project is that if you lose an engine, there is a great danger of losing the plane. With the new Safety Sync on board, if you lose an engine or have a major RPM differential in the air or on the ground, both throttle servos will automatically move to a safe low speed setting. Your plane will then slow down without any snaps or spins. To regain engine control, just bring the throttle back to minimum and the Safety Sync will return the control to you.

FEATURES:

- The Safety Sync will synchronize both engines throughout the entire throttle range. The slower engine's throttle servo will advance as required.
- Automatic throttle servo cut back of both engines if excessive RPM differential is detected by the Safety Sync (sync failure mode).
- Adjustable low engine speed in sync failure mode and adjustable RPM differential to enter sync failure mode.
- Adjustable throttle set point to exit sync failure mode and bypass push button to allow runup of one engine.
- Adjustable maximum RPM range: 5,000-25,000.
- Output to drive Strobe light indicator. Provides a visual alert if the Safety Sync has switched into the sync failure mode. With other planes in the air, you can't always hear that you have lost an engine.
- Comes complete with connectors (specify), easy to mount magnetic pick up coils, spinner magnets, and instructions.
- Dimensions 1" x 2" x 4" (2oz.) • Low power consumption CMOS design.

Send Check or Money Order to: R/C USA • P.O. Box 323, Virginia City NV 89440 (Nevada residents add applicable sales tax)



CALL (702) 847-9049

O.S. 160

(Continued from page 21)

Last, in pursuit of a quick-fix muffling device that wouldn't affect scale appearance too much, a 3-inch length of 7mm-i.d. silicone tubing was fitted to each exhaust stub, and this had a noticeable effect on sound production—around 1 1/2dB reduction on average.

VALVE CLEARANCES

Throughout the tests, and to check valve timing, a tappet clearance (or valve lash) of 0.002 inch was maintained. This was measured when the

engine was cold. When it was hot, this clearance typically rose to 0.007 inch or more.

The oil-drain nipple at the bottom of the rear cover deposits a fair amount of fuel/oil during running, so O.S. advises the use of a length of silicone tubing to route this away from the model.

IDLING

This was delightful, with an admittedly heavy 20x10 fiberglass Kavan prop fitted; 1,200rpm was possible, with 1,500 being slightly more realistic. With plugs lit, however, 870rpm was

feasible, and this was, on one occasion, allowed to idle in this way for nine minutes while other matters were attended to!

SUMMARY

The Gemini FT-160 flat twin proved a strong, crisp, reliable performer on this test. Compression, starting, idling and throttle response were all fine at the end of the tests. It's difficult to fault its fitness for purpose; structurally, it's as refined and practical as a model engine can be at the present time.

(Continued on page 72)

SR Electric Heli Packs!

If you're into Electric Helicopters, SR gives you 3 packs to choose from. First, there's the 1100 Max Series pack. It's the lightest and most maneuverable of the 3, but it will give you up to 5 minutes of flying time with a stock Heli.

Next, there is the 1500 Max Series pack. Although it weighs 3.5oz more, it's the right choice if you've hopped up your Heli with a modified motor.

Finally, there's the 1800 Magnum Series pack. If you're learning to hover, the 1800 Magnum will give you up to 10 minutes of flight time so you can be flying instead of charging!

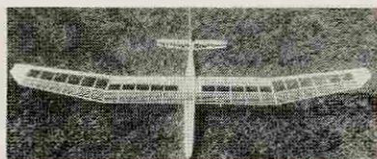
SR stocks everything else you'll need for Electric Flight too, including... motors, chargers, speed controls, props, etc.. We'll answer your questions and help you select what you need, not what you don't.

To place an order, give us a call at 516-286-0079 or send \$2 for complete prices and specifications.



SR BATTERIES, INC., BOX 287, BELLPORT, NEW YORK 11713 (516) 286-0079 FAX (516) 286-0901

by Jim Bonk



The first time I saw a picture of an Easy Eagle, I knew instantly that I had to have one. At last I would have a 2-meter sailplane that would be easy to land! The flaps on the Easy Eagle make precise landings rather easy—you will find yourself looking for ways to put flaps on every glider kit you look at in the future.

To spot-land, your approach should be rather high (about 6 feet high at 15 to 20 feet out) and rather steep and fast (as opposed to trying to float it in). Then drop the flaps. With enough elevator mixed in—either through mixing in the transmitter or by manual means—you will land in a steep but *slow* glide. Nothing builds confidence faster than consistently landing the airplane right at the spot.

Most 2-meter polyhedral ships have a bit of a lag time between the pilot moving the rudder stick and the airplane actually turning. In the Eagle this lag time is longer, so turns have to be started a little sooner. The designer apparently intentionally deviated from typical 2-meter polyhedral design. In order to drive the flaps with a single torque rod, the center wing section has to be flat, and this may be what slows the turns. However, none of the Easy Eagle builder/fliers who I've talked to would be willing to give up the advantages that the flaps offer. Reflexed flaps definitely give the Eagle a speed boost.

I strongly recommend that Eagle builders reinforce the joints at the leading and trailing edges at the junction of the center and outer wing panels. Because the flaps end at the joint of the center and outer wing panels, the outer wing panel's only support at the trailing edge is a single balsa rib. A wing-tip strike on landing can cause the dihedral brace to flex, crack this rib and damage the leading-edge joint; so be safe and reinforce it.

To make building the wing tips easier, use slow-setting white glue, be very fussy about the wood you're going to use, and plan an evening's building session. Butt-glue and rough-trim the pieces that form the top sheeting to shape. The trimmed panels allow you to see what you're doing, and the white glue gives you plenty of time to use weights, pins, etc.

I think this kit is a great first contest sailplane. It's inexpensive, quite strong for a built-up kit (i.e., mine has tolerated zealous winch launches), and will get you landing points every time.

CONSTRUCTION

The Easy Eagle is built using traditional materials and the modeler's choice of carpenter's glue or CA. The fin, rudder, stabilizer and elevator are built-up from sticks by pinning parts over the plans. The fuselage is assembled with interlocking parts and goes together quickly. The wings are built over the plans in three sections. A special 1/32-inch plywood spacer strip is provided to help build an accurate airfoil—one of the performance features of the kit. It's pinned to the building board under the trailing-edge stock.

Three kit features enhance flight performance: the flaps extend both the high end and low end of the speed range, the Mylar wing trailing edges reduce drag and increase speed, and the

Harley's Hinges provide a gapless fit of the movable control surfaces to reduce drag.

I have three building tips. Rough-up the surface of the trailing-edge Mylar so the adhesive can get a grip. Leave the piece in the die-cut fuselage lightening hole under the wing intact, and glue it in place to strengthen the fuse (it's located where you naturally grip it for launch). Finally, cover the flaps *before* mounting them to the wing.

I covered my Easy Eagle with Carl Goldberg* Ultracote and decorated it with kit stickers plus lettering and stars from AMP Graphics*. The fuselage nose is painted.



The outer wing panel is built up from die-cut ribs over plans. The traditional construction method is speeded up with modern adhesives—CA glue and accelerator. A right-angle gauge is provided in the kit.

Construction, covering and finishing took me 33 hours.

RADIO INSTALLATION AND BALANCING

The servo-rail system designed into the kit is solid and convenient, and radio installation goes quickly. Full-size receivers and servos fit easily inside the fuselage. I used an Airtronics* VG4R set with a standard

500mAh battery pack. With the radio installed, the model needed 2 ounces of nose weight to balance as specified. The flying weight of my aircraft is 36.5 ounces.

FLIGHT TESTING

The Easy Eagle flew smoothly and eagerly from hand tosses, and indicated no problems with trim, balance or control throws as built. With one day of practice before my last contest of the 1991 season, I eagerly turned to winch launches. Flaps lowered about 30 degrees gave an impressive steep launch path and a gratifying high release.

SPECIFICATIONS

Type: Thermal sailplane
Wingspan: 78½ inches (2-meter)
Wing area: 648 square inches
Weight: 36.5 ounces
Wing loading: 8.1 ounces per square foot
Length: 39¼ inches
Airfoil: SD-7032 with turbulator spars
Washout: Yes
Wing construction: Built-up
Fuselage construction: Built-up; slab-sided
No. of channels req'd: 3 (rudder, elevator, flaps)
Price: \$54.95

Features: this is a refined, balsa-and-ply 2-meter sailplane with advanced trainer capabilities. All hardware is included. The

airfoil, flaps and special gapless hinging method combine to give a smooth-flying model with a wide speed range.

Hits:

- Best speed range of any 2-meter, open-class glider I've flown.
- Incorporates advanced features in this category of sailplane, increasing performance versatility.

Misses:

- Low-speed turning is slow.
- Under severe competition conditions, the stock wing can be overstressed; strengthening it may be prudent.

FLIGHT PERFORMANCE

• Launch and landing

On high start and winch launches the Easy Eagle tracks straight and gains height quickly and more easily than many 2-meter ships owing to its effective



PHOTOS BY DAVID D. GARMON

flaps. It releases the tow line automatically and begins a fast, stable glide. The flaps give the pilot great control during the landing approach. Dropping them 45 to 90 degrees slows the Easy Eagle dramatically, and increases the glide-path angle for safe, rapid descents, making accurate spot landings a cinch.

• Slow-flight characteristics

Lowering the flaps 5 or 10 degrees gives the model a slow, floating flight, making it easy to loiter in thermals. Thermal turns tend to tighten on their own, and the Easy Eagle sometimes needs opposite rudder (cross control) to prevent it from entering a spiral dive. Rudder input softens drastically at low speeds. Unless the pilot takes care to keep the speed up, downwind turns quickly create angst and accidents. This is not a slope soarer.

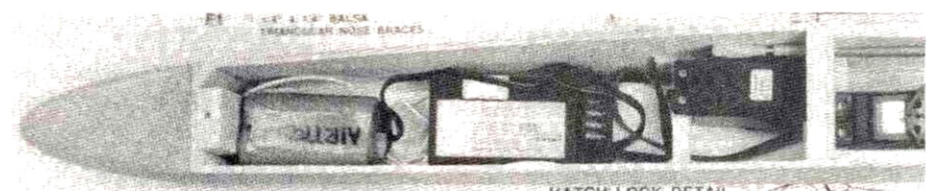
• High-speed handling

The semisymmetrical airfoil makes the Easy Eagle faster than most balsa-rib 2-meter sailplanes. Reflex the flaps up 5 degrees, and it will outrun almost any open-bay balsa thermal glider on the field. The turning ability is substantially improved at speed; it's adequate without being touchy. The high-speed performance allows you to make a blistering downwind landing approach, pull up into a sweeping turn to bleed off speed, turn into the wind and drop the flaps down for a float-it-in spot landing. The world loves a hot-dogger.

• Aerobatics

Build speed in a shallow dive, and the Easy Eagle loops easily. Just haul back slightly on the elevator stick—no rudder input is needed. It's not designed for any other aerobatics, but it flies inverted better than any polyhedral 2-meter I've ever flown or seen flown, perhaps owing to its flatter wing.

EASY EAGLE



The front portion of the fuselage shows generous room for mounting radio equipment. Although mini servos are specified, standard-size equipment fits easily.

Over the dozen or so winch launches on the first day, I was mighty impressed with the Easy Eagle's hands-off stability and its wide speed range, which is obtained by changing the flap position. Turns were a little slow, and I increased the rudder throw to 2 1/8 inches each way—twice the factory recommenda-



The main wing panel shows the plywood shear web at the center and balsa shear webs for the remainder of the wing. Note the four Harlequin spars at the top, and the rubber Harlequin's Hinges used for flaps, rudder and elevator.

tion—but I noticed only a small improvement. To compensate, I take care to keep up the speed in turns.

COMPETITION

With about a dozen flights the day before, I stepped confidently to the winch at the Fall Sailplane Challenge in Simsbury, CT. Deploying the flaps as explained in the assembly manual, the first launch was great, and while I didn't make the 6-minute maximum flight time, the Easy Eagle scored high on landing points.

Because of weak lift under an overcast sky, I followed advice given on page 12 of the instructions: "Expert flyers will reflex as they 'top out' on the tow to build speed, then dive to release at high speed and 'zoom' up for the most altitude." The launch began well, but suddenly the wing folded. The wing broke 2 inches to the right of the center line, where the plywood shear web ends and balsa shear webs begin.

I returned the wing to Ace R/C for inspection. Ace replied that they had not experienced problems with the design, had not received complaints on the kit, and felt that the construction was sound. Ace noted that on occasion, these things happen.

REPAIRS

I repaired the wing with a dowel joiner, longer plywood shear webs, and .014-inch-thick carbon-fiber tape laminated onto the outside sur-

face of the top and bottom spars. In the spring, I began flying the model again in practice for the 1992 contest season. The repaired wing held up fine through 30 to 40 zoom launches, until one day, wing flutter on tow fractured the sub-trailing edge on both sides. This was repaired with fiberglass and the Easy Eagle gave several weeks of good service.

AT THE NATS

On my first launch at the 1992 NATS at Westover AFB, MA, the Easy Eagle climbed steeply with flaps down 30 degrees. Nearing the top of the launch, I brought the flaps up to build speed before release, when violent flutter fractured the wing on both sides of the plywood center sheeting and at one polyhedral joint. My original wing, now twice repaired, had broken in three new places.

Terry Edmonds, who had come from the Eastern Iowa Soaring Society to compete in and write about the NATS, timed this 5-second flight. Terry pointed out that the winches and batteries were new, the batteries were continuously charged, and we were launching with line retrievers (which may cause pilots to step harder on the pedal to make up for speed lost to drag). These factors plus the high level of competition combined to make it more likely to exceed the airplane's capabilities here than at other times. I also observed two other sailplanes suffer folded wings on launch during the 2-meter contest. Three of the 61 entered is about a 5-percent launch-failure rate.

The first page of the assembly manual explains that when winch launching: "With a properly built EE you can 'go for broke' without worrying if the wing will fold." Although mine had shown there are exceptions, the odds of this happening can be lowered. *Model Airplane News'* soaring columnist Mike Lachowski observed that doubling the spars for about 14 inches out from the center line on each side and using one-piece shear webs in the center section would greatly strengthen the wing. "Cut the ribs, not the webs," he suggested (meaning the webbing should cut through the ribs, not vice versa).

(Continued on page 73)

1992 NCFFA
Competition

FUN FLY NATS

**World
record
times**



Jerry L. Smith (left), father of the Smith Special, and Harold Parker, designer of the Coal Hauler, put on a freewheeling exhibition during a competition break. The planes are shown immediately after liftoff.



PHOTOS BY TOM ATWOOD

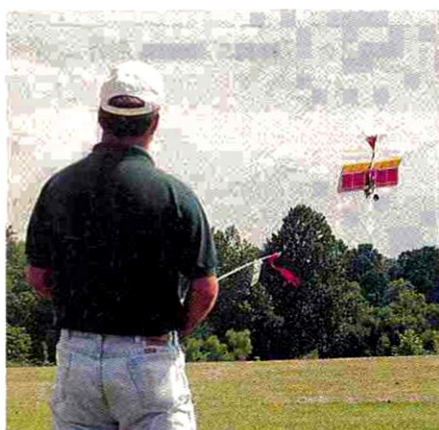
by TOM ATWOOD

Rolly Siemonsen's aircraft is shown doing loops. Note how tight they are relative to the trees in the background. Rolly took 1st place in the Sportsman Class.

ON LABOR DAY weekend, the National Competition Fun Fly Association* (NCFFA) and *Model Airplane News*, with the valued support of many contributing industry sponsors, held the 1992 Summer National Competition Fun Fly in Nashville, TN. Ably hosted by the indefatigable Music City Aviators, with assistance from members

of the Middle Tennessee R/C Society and the Columbia RC Flying Modelers, this high-tension competition played out in two action-packed days. The contest took place at the beautiful Peeler Park flying field a few miles outside Nashville.

With 42 top competitors from as far away as New Mexico, Ontario and Ohio in the



Above: David Grantham, who took 2nd in Expert, at the sticks. Below: Steve Luchaco holds the transmitter as Bob Hastings prepares for competition.



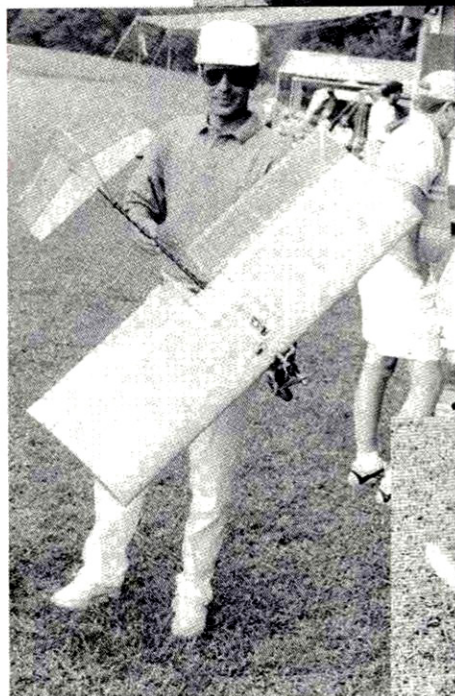
action, this Fun Fly "Nats" had all the flavor of a national event. The weather, although rainy in the mornings and evenings, spared the contestants any serious interruption. The airplanes competing this year showed the direction the most competitive ships are headed in, as is noted in greater detail below.

"COMPETITION FUN FLYING"?

"Fun-fly competition" has come to describe a unique and fast-growing branch of low-speed, timed aerobatics competition. Several southerners played key roles in the development of the "stick"-type aircraft that best excel at these maneuvers (see January '92 *Model Airplane News*, 1991 Fun Fly Nats, page 76).

Although catching on fast across the nation, competition fun flying is still in its infancy. Contests were organized by R/C Report in previous years, and in 1992, the NCFFA was formed to give active "fun-fly" competitors a forum and voice in the AMA. *Model Airplane News* became involved in the sponsorship of this year's competition because we believe it represents some of the best in R/C aeromodeling—heart-stopping competition and technical innovation in aircraft design.

The object in a fun-fly competition is to perform a series of maneuvers in as short a time as possible. Because the maneuvers are strictly defined, there is minimal subjective interpretation on the part of the judges (or so the theory goes!). Why compete? Most modelers are pleasantly surprised by the unprecedented agility of these new craft. Moreover, flying against the clock tends to even the play-



Above: Jeffery Gilbert Jr., who came out 1st overall, stands in front of the generous selection of prizes donated by the contributing sponsors. Left: Roy Pinner shows his scratch-built design—the Snap, Crackle and Pop—which utilized an innovative angled elevator. Below: this fun-fly aircraft (owner unknown) shows minimal structure and a clustering of the servos around the boom to minimize mass at the wingtips.

EVENTS FLOWN

The competition included the following official NCFFA events:

- **Event 1, Roops:** takeoff, roll-loop, roll-loop, roll-loop, roll-loop, roll-loop, touchdown (total of five roops).
- **Event 3, Modified Dixie Death Double:** 3 loops, 3 rolls, (spins were omitted) and touchdown (and repeated a second time before the clock stopped).
- **Event 5, 10 Takeoffs and Landings:** to be performed with 360-degree heading changes between each takeoff and landing (whether circles or loops).
- **Event 9, 10 Loops:** takeoff, 10 loops, touchdown.

The clock stopped when the plane touched down, and all touches had to be made with the main gear. The wheels on contestants' planes were painted with a white stripe during technical inspection. When a plane touched down,

the turning of the wheel would be a highly visible indicator for the judges. Loops had to be flown within 30 degrees of vertical to count. If any apparatus fell off of the airplane before or at touchdown, the flight counted as a 60-second flight. An exception—breaking a prop on landing would be allowed.

Each contestant flew each event twice. Three judges timed each flight, and the high and low scores were thrown out. The middle score was recorded for each flight. A contestant's final score was a straight addition of the recorded lowest of two scores for each event. This equated to a point per second. Expert and Sportsman Classes were flown.

THE TOP COMPETITOR

During the competition, the whining and wailing of the engines could always be heard above the chatter of the crowd. As scores were posted, competitors gathered around to see how the standings were developing. At the end, 16-year-old Jeffery Gilbert Jr. had aced



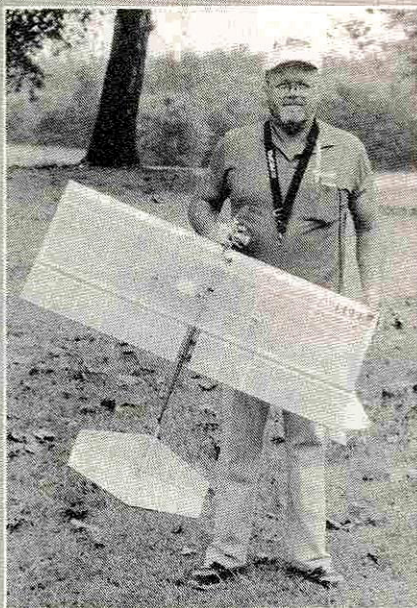
Jerry Smith shows how the absence of a central piece of reinforcing wood between the leading and trailing edges enables the composite boom to flex during touch-and-go's—a key advance pioneered by Jeff Gilbert Sr., who took home the Technical Achievement award.

ing field and bring out the competitor in any R/C pilot. But to be a champion, two ingredients are required: nimble thumbs and a progressive aircraft design. Many examples of both were found at the Nashville Nats.

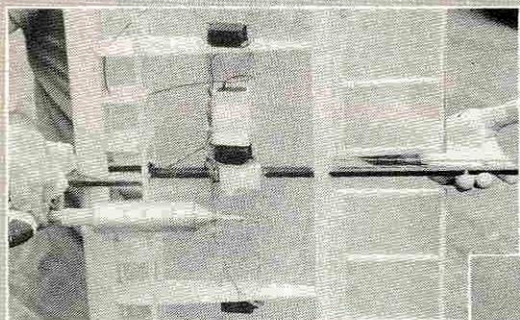
Two Pounds Two Ounces!

Harold Parker, one of the fathers of fun-fly competition, took the lightest airplane to the NATS—a 2-pound, 2-ounce airplane, fueled. Several speculated it may have been the most competitive design. Harold is a soft-spoken, modest individual who is quick to note that he has picked up many design and weight-saving features from others.

Harold flies an Enya 35 heli engine (15 percent Omega fuel) "because it has the best power-to-weight ratio I know of." He weighs his Rev-Up 10x5 props to select the lightest one for competition and uses a turned-down aluminum hub.

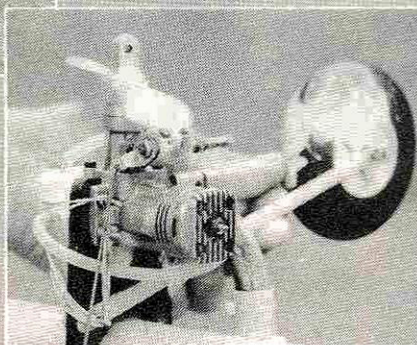


Above: Harold Parker holds his latest variant of the Coal Hauler design. Left: note the absence of a center rib structure, capstrips or any other unnecessary structure. Below: to save weight, the Enya 35 heli engine has been filed down, its bolt holes counter-bored, and the aluminum hub turned down. The Dave Brown wheel has also been modified to save weight.



The plane, which has a 44-inch wingspan, is framed with Sig contest balsa, with the exception of two spruce sub-spars and two spruce servo rails. Carbon fiber is used in most of his planes to strengthen the main spar to protect against impact. One side of the ribs in key support areas is covered with Solartex* to increase the strength of the contest balsa. Balsa sheet for the leading edge is wetted with a 50:50 alcohol/water mixture and compressed in a female mold (made of pipe) until it is dry.

For simplicity, weight savings and the ability of the plane to flex on impact, there is no center section



between the leading and trailing edge other than the boom. Harold tracks weight at every point. "I gain a gram by using clear MonoKote. Color adds weight."

The engine is mounted on Bob Violet Models* Magnalite. The composite boom is glued with CA into two

slots cut in the engine mount. The landing gear is made out of a durable, light, glass/plastic composite, and Z-bends are used wherever possible. "There's a lot of durability that goes with lightness, because the plane won't destroy itself on impact."

The engine is heavily filed down, including much of the needle valve. Engine bolt holes are counter-bored "so I can cut $\frac{3}{8}$ to $\frac{1}{2}$ of a steel bolt off. A quarter-inch of that steel is worth a good chunk of balsa." Aluminum mounting bolts are used. The 26-gram tuned pipe is homemade, and starts with a Mac header. Harold uses Dave Brown light wheels, with weight carved from inside the hub as well as the tire itself.

Servos are JR 4721s that offer 119 inch/ounces—"the only thing to use if you want the ultimate." An SR 150 Series 4.8V battery pack provides enough juice for three to five competition flights. Ailerons deflect upward about 70 degrees and downward about 45 degrees. The CG position is about 5.25 inches on a total chord of about 17 inches (5-inch ailerons). The elevator deflects upward about 45 degrees, and 10 degrees downward.

The airfoil on the latest ship was the same as that used on the Coal Hauler kits (Florio Flyers* kit is engineered from the model Harold flew last year), but slightly thinner because of the absence of capstrips, and slightly pointier because the leading-edge sheeting was not recessed. "It penetrates the wind better." When I asked Harold if he had considered a free flying stab, he said sure he had, "but it won't come even close to what the plane is now doing in performance." Harold concluded: "I can't fly with the best of these boys, but very seldom do they get ahead of me on airplanes. I keep all the advantage I can to compete with them."

the competition while creating some new world records. He flew the modified Dixie Death Double in 14.94 seconds, beating by nearly 2 seconds David Grantham's previous record of 16.7 seconds. Jeff also brought in the best Ten Takeoff and Landings score—14.56 seconds, besting Mac Hodges' previous record of 18.7 seconds. Gilbert wasn't the only record setter. Jeff Welter's score for 10 Loops was 11.09 seconds, which is the

world record to beat.

Jeff Gilbert flew his own design, named the Lil Ripper. It has a semisymmetrical airfoil, 44-inch wingspan and total weight of 2 pounds, 6 ounces. A 2-ounce fuel tank feeding an Enya 35 heli engine keeps the Ultracote-covered ship airborne. Jeff's airplane incorporates the design innovation for which Jeff Gilbert Sr. won the technical achievement award; there is no central rib or

wooden structural bracing between the leading and trailing edges of the airplane other than the composite boom. Jeff's plane was controlled by a Futaba transmitter and RCD receiver.

TECHNICAL INNOVATION

Many experiments have been undertaken to see what might increase the low-speed aerobatic capability of these craft. Full-flying

NATIONAL FUN FLY TOP WINNERS—EXPERT CLASS

| | Roops | Loops | Dixie | T.A.G. | Total |
|------------------|-------|-------|-------|--------|-------|
| 1 J. Gilbert Jr. | 10.4 | 14.5 | 14.94 | 14.56 | 54.40 |
| 2 D. Grantham | 10.17 | 11.35 | 17.46 | 16.50 | 55.48 |
| 3 C. Plumley | 11.38 | 11.28 | 16.57 | 16.95 | 56.18 |
| 4 J. Welter | 9.73 | 11.09 | 16.37 | 19.01 | 56.20 |
| 5 J.L. Smith | 10.20 | 10.99 | 16.78 | 22.15 | 60.12 |
| 6 D. Baron | 12.42 | 15.90 | 19.87 | 22.31 | 70.50 |
| 7 J. Gilbert Sr. | 14.72 | 17.69 | 21.16 | 18.54 | 72.11 |
| 8 C. Andra | 14.06 | 14.79 | 20.73 | 23.86 | 73.44 |
| 9 B. Wachtler | 15.12 | 12.28 | 21.02 | 26.25 | 74.67 |
| 10 K. Jackson | 10.53 | 12.14 | 18.70 | 33.91 | 75.28 |



The top five winners in the Expert Class pose with their prizes (left to right, 1st to 5th place).

WINNERS' PROFILES

| Name | Age | Design Origin | WS | WT(lbs./oz.) | Eng. | Prop | Nitro % |
|------------------|-----|-----------------------|----|--------------|--------------|---------|---------|
| 1 J. Gilbert Jr. | 16 | Gilbert | 44 | 2.6 | Enya .35H | 10x4 RU | 15 |
| 2 D. Grantham | 30 | Parker/Grantham | 44 | 2.6 | Enya .35H | 10x5 RU | 25 |
| 3 C. Plumley | 27 | Smith/Jackson/Plumley | 44 | 2.9 | HP .40 | 10x5 MA | 15 |
| 4 J. Welter | 20 | Parker | 44 | 2.14 | O.S. .45 | 10x5 MA | 15 |
| 5 J.L. Smith | 49 | Smith | 44 | 2.11 | Webra .32 | 10x5 MA | 25 |
| 6 D. Baron | 34 | Smith (mod) | 44 | 2.12 | Webra .32 | 10x5 TF | 15 |
| 7 J. Gilbert Sr. | 38 | Gilbert | 44 | 2.6 | Enya .35H | 10x4 RU | 15 |
| 8 C. Andra | 30 | Andra | 44 | 3 | Fox 40 d'lux | 10x5 TF | 15 |

stabs; larger ailerons; stabilizers with rounded trailing edges to better deflect the propwash; split full-flying, vee-tail stabs with elevon-like control—even the mounting of a helicopter rotor at the back of the boom to assist the stab or rudder—have been tried in the backyards and at the local flying fields of competition fun-fly fans.

At this year's Nats, perhaps the most unusual experiment was brought by Azarr of Air Flair. It was a fun-fly airplane with full pitcheron control, i.e., the main wings independently pivoted to control pitch and roll, and the vee-tail was fixed. This was only a prototype and was not entered in competition. Reportedly, flight-testing had not substantiated this design as an advance, although working out the servo-control arrangements, given the loads involved, was an engineering achievement in itself. There was some speculation at the contest, also, that tapered wings

vos to the absolute middle of the wing (the aileron horns were mounted at the root end of the ailerons). This placed mass at the center of the wing, and that helped increase roll rates.

Roy Pinner used an innovative stab design with the elevator hinge line angled aft (see photo). Theoretically, this would gather a pocket of high-pressure air for greater pitch control. Roy noted that when he first developed this design, he had to reduce his elevator deflection because he found himself snapping booms!

David Baron's "Smith Super Special" used a full-flying stab that had a slight dihedral built into it. He was one of four pilots using this new technology, and this may be the beginning of a trend (for those who are interested, a composite bearing mechanism for attaching the flying stab is distributed by Florio Flyer).

By looking at design features of the com-

NATIONAL FUN FLY TOP WINNERS—SPORTSMAN CLASS

| | Roops | Loops | Dixie | T.A.G. | Total |
|----------------|-------|-------|-------|--------|--------|
| 1 R. Siemonsen | 18.44 | 18.38 | 24.82 | 34.00 | 95.64 |
| 2 K. Allen | 16.87 | 17.37 | 22.36 | 49.75 | 106.40 |
| 3 D. Luchaco | 16.60 | 16.53 | 26.29 | 48.22 | 107.60 |
| 4 M. Stokes | 17.70 | 18.13 | 22.79 | 54.46 | 113.10 |
| 5 B. Thomas | 14.57 | 17.89 | 21.93 | 60.00 | 114.40 |



might permit faster roll rates, but no R&D testing has apparently been done.

David Grantham, 2nd-place winner in Expert, flew a plane that incorporated elements of Harold Parker's Coal Hauler and David Halverson's Hang Glider. The plane was notable for its use of composite arrow-shaft material for the leading edges of the ailerons. This material will not bend in torsion, and that permitted him to move the ser-

peting aircraft, some lessons can be learned that will come in handy when you build your own competition fun-fly ship.

Of approximately thirty-seven aircraft on which data was collected (not all parameters were recorded for every airplane), fourteen were powered by Webra Speed .32s, nine by HP .40s, six by Enya .35 heli engines and four by O.S. .32s. Of the top five winners, Jeff

(Continued on page 85)

SPONSORS

- Ace R/C
- Fox Mfg. Co.
- Hobby Lobby Intl. Inc.
- SR Batteries
- Airtronics Inc.
- Frank Tiano Enterprises
- Lanier R/C
- Florio Flyer Corp.
- Robart Mfg.
- Robbe Model Sport, Inc.
- B&P Associates
- Futaba Corp. Of America
- Air Flair
- Royal Products Corp.
- Patterson's Hobbies
- Landing Products
- Powermaster Products
- Tower Hobbies
- ZZ Enterprises
- Byron Originals Inc.
- Sig Mfg. Co.
- CB/Tatone Inc.
- Rocket City Specialties
- Dave Brown Products
- The Edger
- Midwest Products Co. Inc.
- United Model Distributors
- Carl Goldberg Models
- Thorpe Engineering Corp.
- Peck Polymers
- Yellow Aircraft
- Tommy Georges Mfg.
- US Aircore
- Cox Hobbies
- Coverite
- Lightning Products
- HiTec RC USA
- Aerospace Composite Products
- Satellite City

HOW TO

Make Scarf Joints

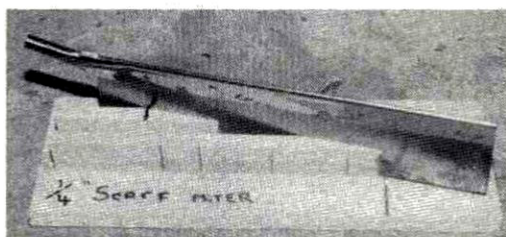
by CLARKE SMILEY

Quick, easy and accurate

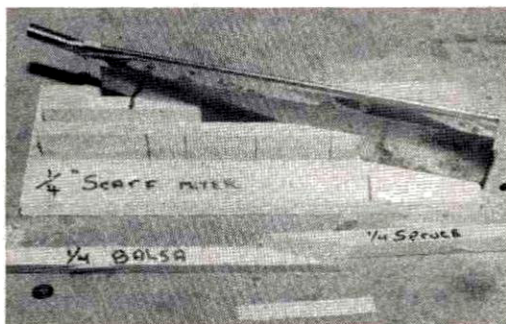
CERTAIN MODEL airplane components require the use of materials in much longer lengths than those that are commercially available. This is particularly the case if you like to build quarter-scale, WW I-era airplanes as I do. Wing spars, fuselage longerons and stringers are such components, and the only way to get the length you need for them is to splice the wood together with a scarf joint.

THE MITER BOX

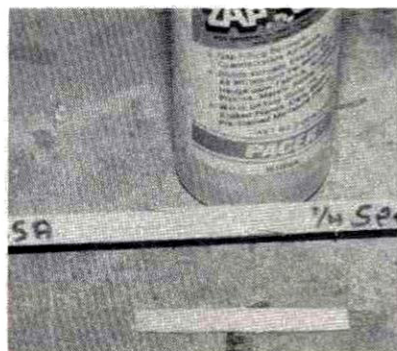
Scarf joints are easy to make if you have the right tool. A miter box is necessary to make long, true cuts, and it's a handy item to have in your shop. Once you have one, you may wonder how you got along without it. My simple miter box is made of scrap wood and doesn't take long to build. The one you see in the photos is for 1/4-inch-thick stock. It has a plywood base onto which I glued two spruce strips. To ensure that you'll be able to use the tool with 1/4-inch-thick stock, place a piece of stock between the stops when you glue them into place. You can make them for all sizes of stock.



Everything you need to build a scarf miter box is probably already in your scrap-wood bin.



To make the splice, cut the first piece of stock while it's to the left of the miter and the second piece while it's to the right. Cut as straight as possible.



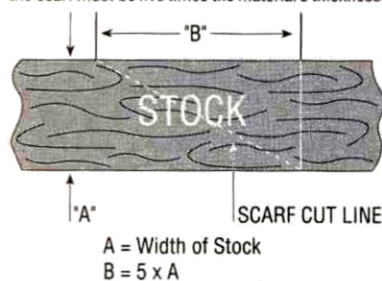
If it has been made correctly, the joint will be so tight that you'll have to look hard to see it. To glue hardwood, I use plenty of thick, gap-filling CA or wood glue, and I make sure that it soaks into the wood. The small doubler at the bottom is a scrap of 1/64-inch plywood.



The final joint, capped with scrap 1/64-inch plywood. Before you work on your model, make a couple of test parts, and then break them after the glue has cured completely. A lot can be learned from "testing to destruction."

SCARF JOINTS

For a scarf joint to be adequately strong, it needs to have a minimum ratio of 5:1, i.e., the length of the scarf must be five times the material's thickness.



Example:

For 1/4" square stock, a scarf length of 1 1/4" ($5 \times 1/4$) is required.

MATERIALS

Everything you need to build a scarf miter box is probably already in your scrap-wood bin. You'll also need a pencil, a straightedge, CA and a razor saw.

Base: 1 piece 3x9x1/4-inch plywood.

Stop rails: 2 pieces 1/4x1/2x9-inch spruce or pine.

SCARF JOINTS

I mark two lines approximately 3 inches apart on each piece of stock to be spliced and make an angled cut from one edge to the other; on 1/4-inch stock, this gives a 1 1/4-inch-long surface for the scarf joint. Scarf joints are the best joints to use with stick-stock material because they have larger gluing areas and transmit the flight loads evenly from one piece of wood to another. My tool gives a 5:1 ratio joint, i.e., length to thickness; this is the least it should be, and some builders will double this. Try to make the scarf cuts as straight as possible.

I use plenty of gap-filling glue when I work with spruce or other hardwood, and I let it soak into the wood. If the area of the joint will be subjected to a lot of vibration or substantial flight loads, I add a 1/64-inch-thick plywood doubler to it.

On full-scale aircraft, wing spars are often spliced. The scarf joints that are used must meet certain requirements. They're cut at a 12:1 ratio, and plywood doublers are glued over the joints for added strength. If it's good enough for the FAA, it should work well for us.

WHERE TO SPLICE

In larger models, it's often necessary to splice strip wood together. If it's done correctly, you can save weight in the tail.

I love WW I-type aircraft, but most seem to have very short nose moments. Balancing these models can be a real problem. I've found that splicing spruce or other hardwood up front—where all the good stuff is attached, i.e., wings, landing gear, motor mounts, etc.—and using balsa for the rear of the fuselage helps to keep the tail light. Doing this, and also using thin plywood gussets where the sticks intersect, results in a very strong structure to which you've added very little weight. Properly made scarf joints are very light indeed. Lighter is always better!

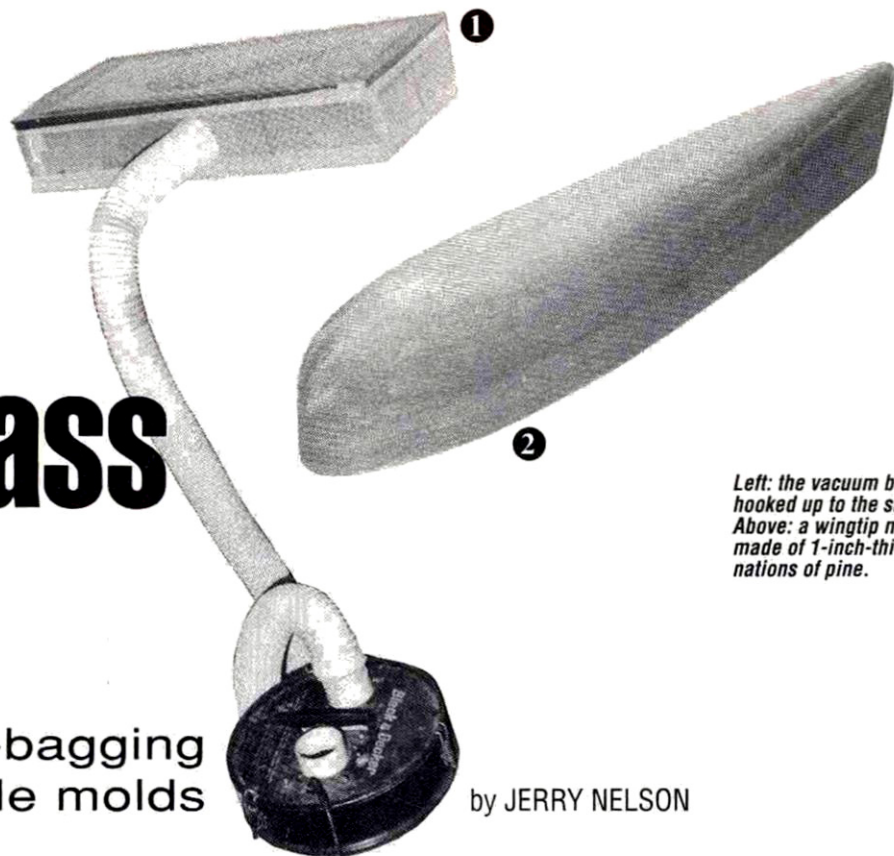
I think I've given you enough information about making strong scarf joints. In a future article, I'll tell you how to make light, strong, vertical and horizontal glue joints, so please stay tuned. Please feel free to contact me with any questions: Clarke Smiley, 23 River Bend, Newmarket, NH 03857.

HOW TO

Make Fiberglass Parts

vacu-bagging
over male molds

by JERRY NELSON



Left: the vacuum box hooked up to the shop vac. Above: a wingtip mold made of 1-inch-thick laminations of pine.

FIBERGLASS PARTS can be made in three ways: on a disposable male mold, inside a female mold and over a permanent male mold.

DISPOSABLE MOLD

The disposable (one-shot) mold is usually a simple shape—such as a wingtip or an engine cowl—made of Styrofoam or hollowed-out balsa. The Styrofoam works well and is easily carved to shape while it's tacked-glued into place onto the actual structure. The foam is covered with fiberglass cloth and epoxy resin. After the resin has cured, the surface is sanded smooth and filled as necessary. The plastic foam can be left in place or removed with solvent and a tool like a knife, file, saw, or chisel. The inside of the remaining fiberglass cloth is quite rough, but this isn't usually a concern.

This method is a relatively simple, economical and quick process, but it's a one-shot deal. The actual mold is destroyed. For some parts, this isn't a problem.

FEMALE MOLD

The common commercial way of producing fiberglass parts is with a female mold. An accurate, permanent, male mold is made out of wood, metal, plaster of Paris, plastic, etc. A reverse, or female mold, is cast over the male mold, and the female mold is used to make the parts, which will have the same surface area and be accurate. Precise details can be made on the female mold, such as panel lines and simulated rivets. Several female molds can be made to make several parts for production purposes. The tooling process, however, is somewhat complicated and quite time-consuming.

MALE MOLD

A permanent male mold is useful for making one-off or limited-production parts, and you need only one mold. The mold's surface finish isn't critical since the part's outer finish will be determined by the weave of the fiberglass cloth.

A disadvantage of this method is that the part will be larger than the mold—by the thickness of the fiberglass cloth and resin. One can com-

pensate for this when making the mold.

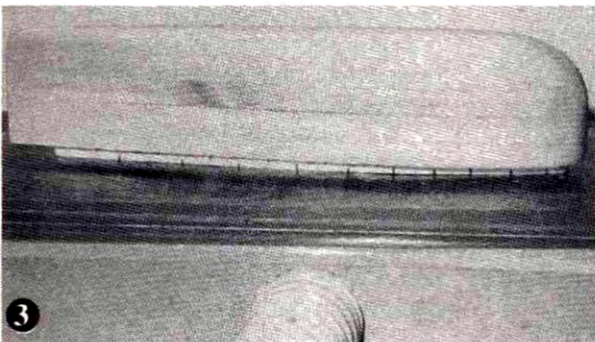
In some cases, however, the increased thickness and unchanged inside dimensions can be helpful, e.g., when making an engine cowl that goes over the outside of the firewall part of the fuselage, or a wingtip that goes over the surface of the wing. When making wheel pants, the increased thickness is of little concern.

When laminating fiberglass cloth and resin onto a mold, care must be taken to prevent the layers of fiberglass cloth from separating. A void will drastically reduce the strength of the part and lead to surface irregularities. The layers of fiberglass cloth are usually put onto the mold one at a time, each layer being added when the resin in the preceding layer has cured. This process can be speeded up by using a vacuum bag.

VACU-BAGGING OVER A MALE MOLD

In this article, I describe how I made a 17½-inch fiberglass wingtip for my AL-1 aluminum project, but you can also use this process to make cowls and wheel pants. I show a one-piece wingtip pattern; the airfoil is semisymmetrical, so a right and left wingtip have to be made. A simple cowl could be made with a one-piece mold, but it may have to be done in two halves to get the fiberglass parts off the mold. Wheel pants would also probably be made in halves. The right- and left-side fiberglass parts will have to be joined later.

Vacu-bagging can be very simple.



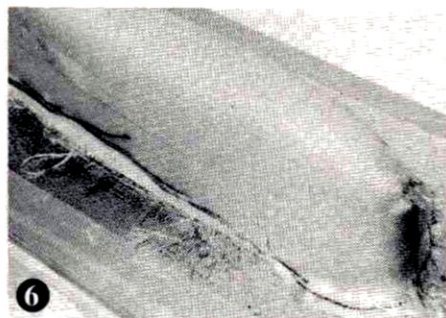
The wingtip mold and spacer have been placed on top of the vacuum box.

Basically, you place a male pattern over a hollow box (call it a vacuum box) that's connected to equipment that can create a vacuum. Holes are drilled in the top of the vacuum box around the perimeter of the male mold. The male mold is covered with fiberglass cloth that's saturated with wet resin, and a thin plastic film is placed over the wet fiberglass cloth. The edges of the film are sealed around the edges of the top surface of the vacuum box. Air is sucked out, and this causes the plastic film to compress over the mold and thus force the fiberglass cloth lamination onto the mold. After the resin has initially set, the vacuum source is turned off, and the resin is left to harden as required.

BUILDING A VACUUM BOX

The length and width of your vacuum box will be determined by the size of the parts you plan to make. Make it about 4 inches bigger in all dimensions than the largest part you ever expect to make. You might as well make it big enough for that future giant-scale engine cowl, wingtips, or wheel pants.

The photos show a box that measures approximately 12x24x5 inches. Its sides and ends are made of 1x4-inch pine, and the top and bottom of 1/2-inch-thick particle-board shelving material. The pine is attached to the particle board with white glue and nails. Use a wood hole cutter (available at hardware stores) to make the 2 1/4-inch hole that will take a workshop vacuum-hose fitting. Seal all the joints with fiberglass strapping tape or duct tape.



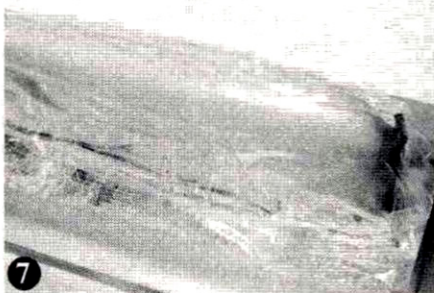
6 Fiberglass cloth soaked with resin is placed over the mold.

The top of the vacuum box is covered with aluminum, or sheet metal, and held in place with duct tape. The smooth, non-porous metal will prevent the resin from sticking to the top of the vacuum box. You could finish the top of the box with resin and a wax parting agent, but that's a lot more work.

MAKING A MALE MOLD

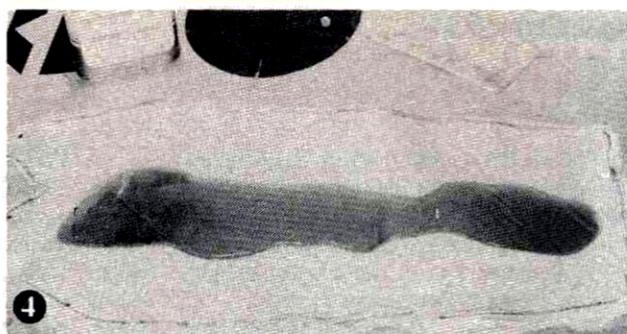
Inexpensive, 1-inch-thick pine is excellent for molds because it's easily shaped with a band saw and a belt sander or disk sander. Glue several pieces together with white glue to make your initial block, clamping the pieces together as necessary. The "lamination lines" are helpful guides for shaping. If you don't have a sander, make your mold out of balsa wood because it's softer and easy to shape without power tools; it will be strong enough.

The male mold must be sealed and reasonably smooth. I suggest the use of three coats of K&B* polyester resin. Apply two coats and then sand smooth. Apply the final coat, and wet-sand it with 220-grit wet-and-dry sandpaper. Cover the mold with four or five coats of fiberglass mold-release wax, polish the wax,

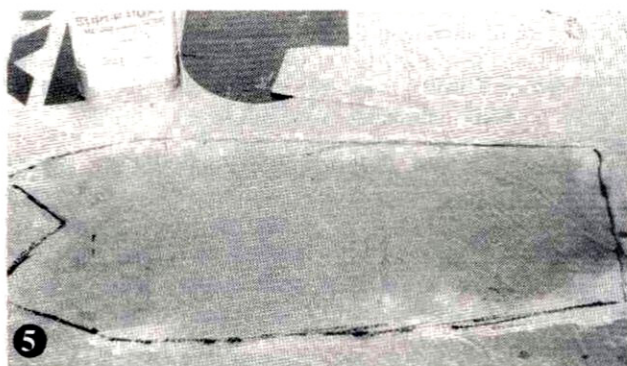


7 Plastic sheet is placed over the wet fiberglass, and its edges are sealed with duct tape.

When the vacuum equipment is turned on, the plastic will be pulled against the mold. Note how it's pulled under the mold and keeps the fiberglass tightly against it.



4 Three ounces of resin are poured onto the fiberglass cloth.



5 Resin is spread evenly over the cloth.

then spray on a coat of PVA mold release. (The special wax and PVA mold release can be obtained at stores in which fiberglass materials for boats and cars are sold.)

All surfaces should have a relief angle of at least 5 degrees. Having surfaces parallel to each other may make it difficult to remove the part from the mold. If there's a negative relief angle or a depression in the mold, the part may be impossible to remove without damaging the part or the mold.

A 1/4- to 3/8-inch-thick spacer (balsa is OK), goes under the male mold. It's about 3/16 to 1/4 inch smaller than the base of the mold. Grooves are cut in it to distribute the vacuum. The spacer allows the vacuum to pull the plastic film around the bottom edges of the mold.

PREPARE THE VACUUM BOX

Place the mold in the center of the vacuum box. With a marker, draw the outline of the mold's base on the top of the box. Drill 3/16-inch holes every 2 inches or so around this outline. Deburr the edges of the holes so the plastic film won't be torn. Wax the top of the box with parting release wax.

PREPARE THE FIBERGLASS CLOTH

I made the wingtip shown in this article with three layers of 8-ounce fiberglass cloth. It's about 2 1/2 inches thick, 3 1/2 inches wide and 17 1/2 inches long. Sanded smooth and finished, it weighs 4 1/2 ounces. I could have used two layers of cloth, but that wouldn't have made a wingtip strong enough to withstand accidental knocks. Use thinner cloth or fewer layers when making smaller, less vulnerable parts.

(Continued on page 70)

FIBERGLASS

Cut out the necessary layers of fiberglass cloth, and drape them over the mold, making sure that they just touch the top of the vacuum box. You might have to cut slits in the cloth to make it drape. Use an outer layer of light cloth to ensure a smooth outer surface.

Place the layers of fiberglass cloth on top of one another and onto a smooth non-porous surface that can be thrown away. I used a scrap piece of aluminum-skinned insulation foam left over from my AL-1 canopy heating oven, and cardboard is good, too. Pour out 3 ounces of K&B* surfacing resin, and then mix in the hardener. I always use 15 to 20 drops per ounce of hardener instead of the recommended 10 to 12 drops per ounce. Pour the resin along the center of the fiberglass cloth, then use a squeegee to spread it evenly. If, after that, there are some dry spots, make more of the resin/hardener mix, and saturate the cloth in those areas.

Avoid using too much resin. Excess resin doesn't increase strength, but it does increase the weight of the part.

The K&B polyester resin is good for making laminated, fiberglass parts. It's reasonably strong, sets quickly, is easy to sand, relatively safe for your skin and not too expensive.

PUT GLASS CLOTH ONTO THE MOLD

Wearing rubber gloves or a special skin lotion that's available at fiberglass supply stores, pick up the saturated fiberglass cloth and place it over the mold. The gloves and lotion will prevent the resin from sticking to, and perhaps irritating, your skin. Pull, stretch, and slide the cloth so that it covers the mold evenly. Don't worry too much about small wrinkles or folds.

COVER THE MOLD WITH PLASTIC FILM

I use the 0.35-mill plastic sheet that's used as a drop-cloth when painting; just a few cents will buy you enough for a bunch of parts. Cut the plastic large enough to drape over the mold and have extra to go around the top of the vacuum box.

Place the center of the plastic over the mold, and gently press it against the wet fiberglass cloth. Try to remove as many wrinkles as possible by folding the plastic over itself, without moving the fiberglass cloth. Fold over the edges of the plastic so that it doesn't over-

hang the edges of the vacuum box. Use duct tape to seal the edges of the film around the top of the vacuum box.

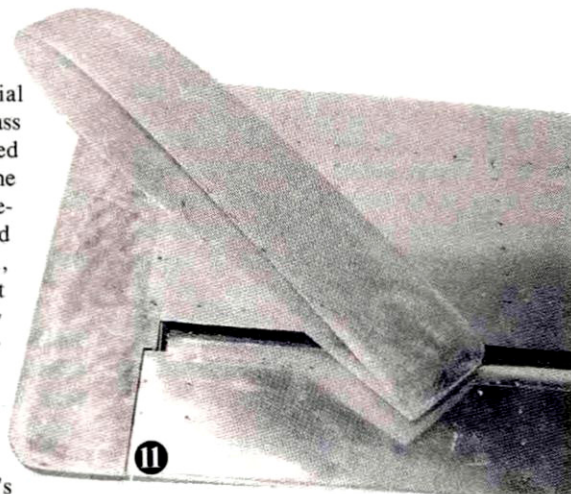
MAKE A VACUUM

I use an old shop vac that's attached to my belt sander and radial-arm saw. Almost any vacuum source can be used, since we're dealing with only a little negative pressure or vacuum.

The vacuum must obviously be turned on before the resin starts to set. The plastic will immediately be sucked onto the wet fiberglass and will force the fiberglass lamination onto the mold. Even though there will be many wrinkles in the plastic, the surface of the fiberglass will be smooth.

Gently try to push the fiberglass cloth around as necessary to eliminate any large bumps that arise when the cloth is folded onto itself, i.e., at the leading edge of the wingtip. If the plastic tears, it might not have any effect on the process, but if there is a leak, repair the hole with duct tape.

If you have trouble keeping the cloth down on the mold at the leading edge, stretch duct tape around the area to keep the cloth in



The finished wingtip on top of the wing panel.

position.

At this point, you may notice excess resin flowing out of the laminations and into the area between the edge of the part and the surface of the vacuum box.

As soon as the resin has set, you can turn off the shop vac. (Mine gets warm; don't let yours run for hours because you might damage it or even cause it to overheat or start an electrical fire). The K&B resin only takes about 15 minutes to set up, and I haven't had any problem with my shop vac overheating during that time.

REMOVE AND TRIM/SAND THE PART

Remove the plastic about an hour-and-a-half after the K&B resin has set. Then use a sharp knife or a chisel to cut the edges of the fiberglass flush with the mold. The resin is in a "green" condition at this stage, and it's relatively easy to cut. When you cut the cloth, be sure to apply force in such a way that the knife will be pushed toward the mold and not into the cloth laminate; you don't want to separate the layers.

After the part has cured overnight, it can be removed from the mold. The K&B resin is stronger after it has cured for 12 hours or more, and the part will be easier to remove from the mold when it's harder. There's also less chance of damaging the part if you remove it from the mold when it's at full strength.

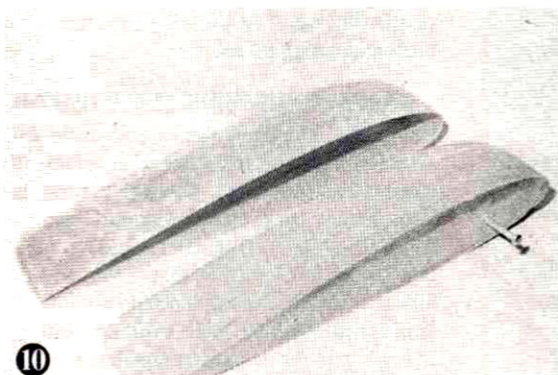
Insert a thin spatula or piece of metal between the fiberglass and the mold. Move the spatula around, and try to break the contact between the mold and the fiberglass. A better method is to use an air hose; blow high-pressure air between the fiberglass and the mold.

The part should come out easily. If it doesn't, try screwing a couple of long, 3/16- or 1/4-inch-diameter wood screws into the bot-

(Continued on page 97)



The part with the plastic sheet removed and the excess fiberglass trimmed off the edges. Note the rough area at the leading edge; it will be sanded off later.



The sanded wingtip has been removed from the mold. Note the large screw that's used to help take the part off the mold.



PHOTOS BY RICH URAVITCH

BY RICH URAVITCH

IT SEEMS THAT, from every category of airplane, there emerge one or two that stand out and endure the passing of time. In the warbird world, it's likely to be the P-51 Mustang; classic "rag" fans would probably choose Piper's ubiquitous J-3 Cub; and the F-16 would get the nod from the under-25 crowd.

But what about in the upside-down world of high-performance aerobatic airplanes? No, I'm not talking about the Decathlon, although it *is* a great starting point and confidence builder. What I mean is the neck-twisting, gut-wrenching, eyeball-popping, aerial hot-rods with vertical speeds of 50 feet per second and roll rates 60 times faster than the second hand on your watch!

Proponents of the biplane school stand strongly behind the Pitts and the Ultimate, while the monoplane mavens cheer the Lasers, Sukhois and, the subject of this article, the Extra 300.

To most R/C modelers, the Extra Series of aerobatic airplanes should need no introduction. It has been around for a number of years in a variety of forms from full kits to ARFs, giant scale to .40 size. With the design presented here, I set out to provide performance similar to that available in the larger models, but in a .25-powered package—hence, the name Extra 3.25.

Because some sport aerobatic airplanes tend to get a little "squirrely" as their dimensions shrink, I opted to use a

(continued on page 75)

FOR SCALED-DOWN

AEROBATICS,

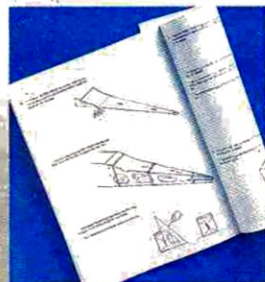
COULDN'T WE ALL

USE A LITTLE

EXTRA?

Extra
3.25

The Freedom 20.™ Proof positive



The Freedom 20's instruction booklet makes building easy—even if you've never built a model before. Clear illustrations guide you through every step of construction and equipment installation. Covering materials and techniques are described, plus there's a section on adjusting and flying your plane.



O.S. 160

(Continued from page 58)

If O.S. finds time hanging heavily, perhaps the matching of their unique Roots supercharger with a flat four would fill the idle hours; they seem to have covered everything else! ■

WING DESIGN

(Continued from page 46)

WING PLANFORMS

• **Elliptical wings.** This is the "ideal" wing planform. It has the lowest induced angle of attack and induced drag and stalls evenly across its span. As Figures 1 and 2 illustrate, these factors increase for tapered or rectangular wings. For example, a rectangular wing of aspect ratio 6 would require an induced angle of attack (τ) 17 percent higher and with induced drag (Δ) 5 percent higher than an elliptical planform (see Figure 2).

Structurally, the elliptical wing is difficult to produce. Each rib is different and wing skins all have a double curvature, chordwise and spanwise. The Spitfire's elliptical wing is a classic example.

• **Rectangular wings.** This is the easiest type to design and build. All ribs are the same, and wing skins have a single chordwise curvature. While it suffers in compari-

son with the elliptical, for small models, it maintains a constant Reynolds number across its span, whereas a tapered wing of the same area could have tip R_n s in the high drag-lower lift and stalling angle range of low R_n s, leading to premature tip-stalls at low speeds.

Structurally, the wing roots need reinforcing, owing to both narrower root chord and higher bending moments. The center of lift of each wing half is further from the center line than an elliptical or tapered wing.

• **Tapered wings.** As Figure 1 illustrates, a tapered wing with a tip chord of 40 percent of the root chord comes closest to the ideal elliptical planform in both induced angle of attack and induced drag. For wings of smaller models, this taper ratio results in narrow tip chords and undesirably low R_n s at low speeds. Increasing the taper ratio produces larger tip chords. The resulting loss in efficiency isn't great and is the "lesser of the two evils."

Structurally, the tapered wing has lower root bending moments, and the wider, deeper root chord provides the greatest strength where it's needed most—at the root. A tapered wing can be lighter yet stronger than a rectangular wing of the same area.

• **Sweptback wings.** This causes similar behavior to decreased taper ratio (smaller tip chord) and leads to early tip stalls with a

nose-up pitch, since the tips, being behind the CG, lose lift. It has a dihedral effect; $2\frac{1}{2}$ degrees of sweepback (measured at 25 percent of the chord) is roughly equivalent to 1 degree of dihedral. It also promotes directional stability; if yawed, the advancing wing's center of drag moves away from the center of gravity, and the opposite, retreating wing's center moves inward. The resulting drag imbalance works to oppose the yaw. Large sweepback angles increase induced drag and lower the wing's maximum lift.

Wings of moderate taper ratios (0.5 to 0.6) with straight-across trailing edges and sweepback leading edges are popular for pattern ships. These wings tip-stall readily for easy entry into wing stalling maneuvers such as snap rolls, spins, etc.

Structurally, a sweptback wing's lift tends to reduce the wingtip's angle of attack, particularly at high speed and high centrifugal force loads. A stiff wing structure will prevent potentially damaging wing flutter.

• **Swept-forward wings.** These tend to stall at the wing root first. The unstalled tips promote good aileron control at high angles of attack. The root stall reduces lift aft of the CG, causing a nose-up pitch.

Forward sweep is destabilizing in yaw. The centers of drag and lift of the advancing wing panel move inboard; on the oppo-

that basic can be beautiful.



At last. A superb sport-trainer that looks as good as it flies.

Lots of "experts" will say you shouldn't worry about looks when you choose a trainer.

Easy for them to say.

They're not the ones who have to show up at the field with a clunky-looking model. And besides, most experts will admit that a better looking plane can actually be a better flying plane.

BETTER LOOKS THAT COME FROM BETTER FLYING.

The Freedom 20's clean lines are really the result of superior aerodynamics.

From its sharp-looking formed cowl to the tip of its swept fin, every contour of the Freedom 20 is carefully refined to help it "track" like it was on rails.

Takeoffs, landings and ground-handling couldn't be easier. Even the classy taper of the Freedom 20's wing isn't just for looks—it's designed to dampen the effects of turbulence

while its unique progressive airfoil completely eliminates "tip stalling."

A DREAM TO FLY THAT'S A DREAM TO BUILD.

Even if you're an inexperienced builder, assembling your Freedom 20 will be a breeze.

You'll work with self-aligning components of precision-cut balsa and plywood. All the fittings and hardware you'll need are included, plus you'll be guided by clearly illustrated, easy-to-follow plans and instructions.

What's more, its featherlight wheels, engine mount and C.G. spinner plus its formed cowl and wheel fairings make your Freedom 20 a value that's hard to top.

See the Freedom 20 at your local dealer's now—it's high time you were flying in style!

CARL GOLDBERG MODELS INC.

FREEDOM 20

WINGSPAN: 55½ INCHES

WING AREA: 440 SQUARE INCHES

LENGTH: 43 INCHES

POWER: .20-.30 2-CYCLE

.20-.30 4-CYCLE

FLYING WEIGHT: 52-60 OUNCES

RADIO: 4 CHANNEL

Kit includes engine mount, C.G. spinner, featherlight wheels, formed cowl and wheel fairings.

site, retracting panel, these centers move outboard. The unequal drag moments increase the yaw, while the unequal lift moments cause a roll, but in a direction opposed to the yaw. Control of this instability calls for increased vertical tail surface area and effectiveness, along with generous dihedral.

Structurally, a wing very stiff in torsion is required to overcome the wingtips' tendency to increase their angle of attack. Any flexibility could be disastrous at high speed.

In full-scale airplanes, modest sweep forward moves the wings' main spar aft, out of the way, and improves the pilot's forward and downward vision.

Part II will continue the discussion of wing planforms, and will include aspect ratio and induced drag discussion. ■

VIDEO VIEWS

(Continued from page 49)

can render landing gear, interiors, struts, gas-filler caps and other delightful minutiae. I would like to have seen more, especially of Charlie Nelson's winning Waco.

There are two groups of modelers who would want to watch this tape: those who attended Top Gun '92 and want to relive the glorious experience, and those who missed it and wish they'd been there. That doesn't leave many of us out.

Though the tape runs for nearly two hours, I was left wanting more, and if that's not enough of a recommendation, the Top Gun video comes with a money-back guarantee. You can't go wrong.

EASY EAGLE

(Continued from page 56)

CONCLUSION

The Easy Eagle has several strong points. Flaps are one—if you're new to flaps, you'll be amazed at how changing the shape of the airfoil in flight adds to the model's flexibility. The Mylar strip method of building trailing edges makes it easy to build thin, strong trailing edges, which permit higher speeds. As noted, the Easy Eagle has an exceptional speed range. The butt-fitted flaps, elevator, and rudder are held in place under tension by the special Harley's Hinges. The no-gap fit reduces drag and noise.

If I were to build this model again, I'd strengthen the wing as suggested by Michael Lachowski, and add carbon fiber to the spars, as is done in some other Ace R/C balsa kits. If you're into gorilla launches, adding carbon fiber to the sub-trailing edge would protect against wing-flutter damage. Although a matter of personal preference, I'd also add 1 inch to the polyhedral to increase turning capability.

If you think of the Easy Eagle as an advanced trainer, I believe you'll be happy with it. It can serve well as a beginning competition machine, and it makes excellent use of a basic 4-channel radio driving three servos. Like most other things, it has some room for improvement, but I found the kit worth the price and the time needed to build it.

* Here are the addresses of the companies mentioned in this article:

Ace R/C Inc., P.O. Box 511, Higginsville, MO 64037; (800) 322-7121.

Carl Goldberg Models, 4737 W. Chicago Ave., Chicago, IL 60651; (312) 626-9550.

AMP Graphics, 36 Park St., Blue Point, NY 11715; (516) 363-5205.

Airtronics Inc., 11 Autry, Irvine, CA 92718; (714) 830-8769. ■

1/3-SCALE CUB

(Continued from page 42)

ble the model. I feed the engine a 32:1 mixture of gasoline and 2-stroke engine oil. For safety, the Zenoah is fitted with a kill switch, and I plan to add another kill switch that will be actuated by the radio.

To start the engine, close the choke and open the throttle halfway. Flip the prop until the engine coughs, and then open the choke and set the throttle to one-quarter. The

(Continued on page 85)

EXTRA 3.25

(continued from page 71)

partially flat-bottom airfoil section rather than one that was fully symmetrical. This tames the flying qualities down to the ability level of the average sport flier, but it doesn't detract from the plane's appearance with regard to the full-size Extra.

The absence of dihedral beyond that created by the taper of the wing itself makes the model neutrally stable with little or no trainer-like, self-righting characteristics. This allows it to be quite aerobatic even with its lifting airfoil. All that means is that I don't recommend the Extra 3.25 to beginners. The tendency to want to build it because it's "cute" or just the right size to fit in your little hatchback should be tempered with the consideration that it's not a trainer, and you should feel comfortable flying a 4-channel, aileron-equipped model before tackling the Extra.

Building this model is not difficult and can be easily accomplished by anyone with a few kits and a scratch-building project or two under his belt. (This is a great time to "plug" my "Scratch-building R/C Airplanes" book, which is available from Air Age Publishing; see the ad elsewhere in this issue.) Building materials are all conventional and available through your local hobby shop or favorite mail-order supplier; there's not a lot of material required, so it's not going to bust your budget!

Rather than forcing you to make your way through a narrative from which you'd need to pick out the construction methods, I decided to present the sequence in the way most successful kits are presented: step by step. These instructions, used with the notes on the plan and the construction photos, should answer most of your questions and make building your version of the little Extra an enjoyable and rewarding experience.

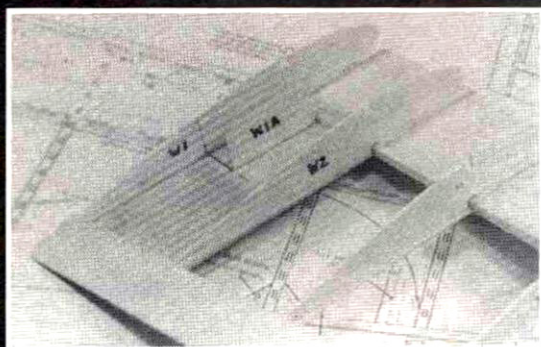
To simplify some of the project and to cut down on your carving and sanding time, I have available a set of vacuum-formed plastic parts for the Extra. The package includes a cowl, wheel pants and a transparent canopy. Cost is \$19.95 U.S. and includes UPS charges to any of the contiguous United States. Orders should be sent to me at the address listed at the end of this article.

WING CONSTRUCTION SEQUENCE

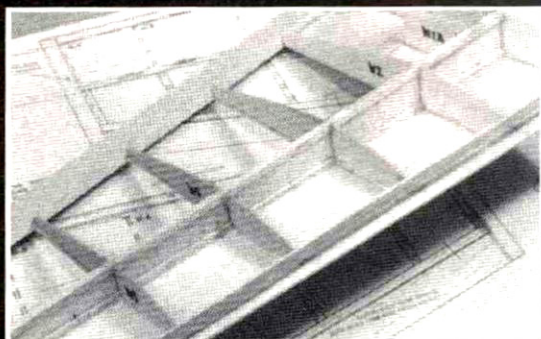
1. After cutting out all wing parts from the appropriate material as specified on the plan, number each of the parts to aid in identification.
2. Protect the plan from adhesives by covering it with wax paper or clear film.
3. Pin the $\frac{1}{16}$ " balsa lower wing LE and center-section sheeting into place over the plan. Glue seams/joints as necessary.
4. Pin trailing-edge stock into place, gluing it to $\frac{1}{16}$ " center-section sheeting.
5. Using the lower spar notches in ribs W2 and W9 as guides, glue the lower $\frac{3}{16}$ " square spar into position. Remove ribs W2 and W9 for later permanent installation.
6. Fit and glue $\frac{1}{16} \times \frac{3}{16}$ balsa capstrips into place at each rib location.
7. Fit and glue $\frac{1}{16}$ " balsa pushrod exit sheet along the inboard side of the capstrip for rib W6.
8. Glue ribs W2 through W9 into place, making sure each is perpendicular to the building surface. NOTE: Apply glue only from spar to trailing edge; do not glue rib to lower LE sheeting at this time.
9. Install all $\frac{1}{16}$ " balsa shear webbing between the spars from W1 to W6. The grain of the webbing is vertically oriented. Fit these webs carefully to ensure contact between the upper and lower spars and the ribs; this strengthens the wing significantly.
10. Add the upper $\frac{3}{16}$ " square spar.
11. Install ribs W1, W1A, W2A and the balsa filler block at the positions shown on the plan. Rib W1 should be perpendicular to the upper $\frac{3}{16}$ " spar.

Before proceeding, pin the structure securely to the building board along the length of rib W1, and install a $\frac{1}{16}$ " temporary shim under rib W9 at the trailing edge. Pin the leading edge of rib W9 to the building board. This will automatically build-in wing washout.

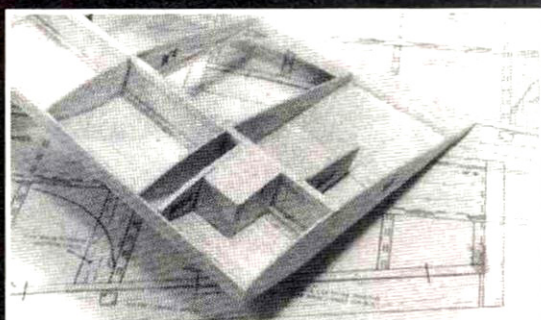
12. Glue the $\frac{1}{16} \times \frac{5}{16}$ balsa LE cap to the front of ribs W2A through W9. Now glue the lower LE sheeting to the ribs and the LE cap.
13. Glue $\frac{1}{16}$ " balsa upper LE sheeting to the ribs and LE cap.
14. Install $\frac{1}{4}$ " balsa gussets on both sides of rib W5 where it joins the trailing edge. Note grain direction.
15. Mark outline of aileron on trailing-edge stock. Carefully cut out and remove aileron portion.
16. Cut all upper $\frac{1}{16} \times \frac{3}{16}$ balsa capstrips to length, and glue into place.
17. Install Nyrod conduit tube for



Rib W1A will form the vertical wall for the servo cutout in the center of the wing. A portion of rib W1 will be removed when wing panels are joined.



All shear webbing has been installed, and the upper spar has been added along with the $\frac{1}{16} \times \frac{5}{16}$ balsa LE cap.



A $\frac{3}{32}$ rib W2A and balsa block should be installed before upper LE sheeting is attached.

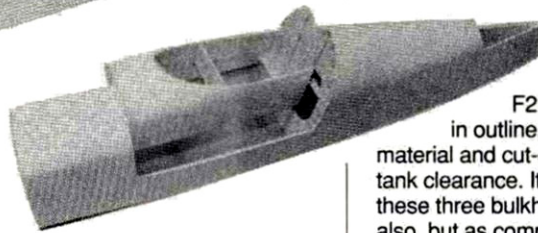
aileron pushrod at position shown. Securely bond the tube to each rib and pushrod exit.

18. Add $\frac{1}{4} \times \frac{1}{2}$ balsa leading edge and wingtip blocks; sand to contour. Use a sanding block to ensure uniformity of cross-section.
19. Repeat steps 1 through 18 to build the opposite wing panel.
20. Install $\frac{1}{16}$ " ply WJ in one wing panel using slow-curing epoxy. Coat the W1 rib of each panel with a thin layer of slow-curing epoxy, and join the panels. Before the epoxy has cured, invert the joined panels on the wax-paper-protected building surface, and weight them sufficiently to ensure that the upper surface remains in contact with the building surface. Temporarily pin the W1 ribs together to ensure proper alignment.
21. Glue the $\frac{1}{8}$ " birch ply/scrap, TE-stock, hold-down plate into place on the upper surface to the wing center section.
22. Wrap center joint with fiberglass tape and resin or Zap*.

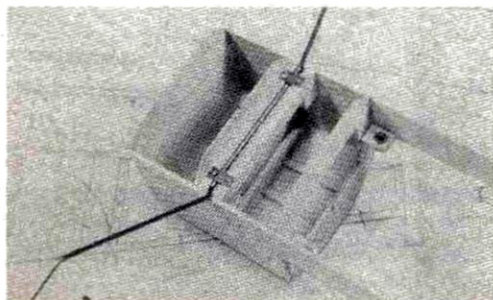
FUSELAGE CONSTRUCTION SEQUENCE



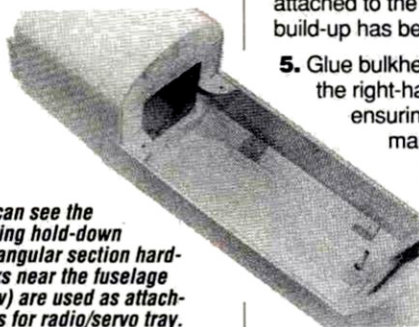
The basic fuselage design is straightforward. It's shown here before upper sheeting has been added.



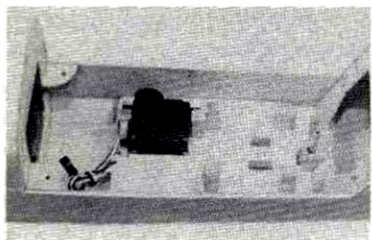
The cockpit section is cut away from the fuselage after sanding. It will later be permanently attached to the removable wing.



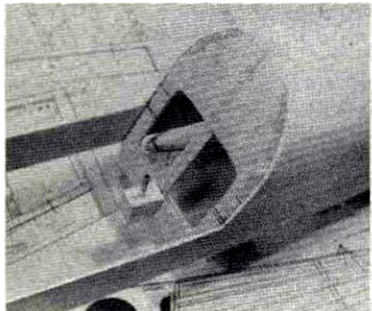
The landing gear consists of two identical $\frac{1}{8}$ " music-wire struts that are plugged into a hardwood block and form a torsion-bar arrangement. Struts should be permanently installed before the lower fuselage is sheeted.



Here, you can see the $\frac{1}{4}$ " ply wing hold-down blocks. Triangular section hardwood blocks near the fuselage floor (arrow) are used as attachment points for radio/servo tray.



Left (top): radio/servo tray installation. All servos lie flat on their sides like the throttle servo shown here. It's the easiest way to stuff a radio into a mid-wing airplane!



Left (bottom): rear attachment-screw tube guide and support block.

Notes: (a) To conserve wood, all bulkheads may be cut out in halves, joined at the center line and reinforced as indicated. If this method is chosen, symmetry is assured if two pieces of

wood are stacked and cut to the half outline at one time.

(b) Bulkheads F1, F2 and F3 are identical in outline, differing only in material and cut-out sections for fuel-tank clearance. It is recommended that these three bulkheads be "stack-cut" also, but as complete pieces rather than halves.

1. After cutting out all fuselage parts from the appropriate material as specified in the plan, number each part to aid in identification.

2. Prepare a left and right fuselage side by laminating the $\frac{1}{32}$ " ply fuselage doubler to the $\frac{3}{32}$ " balsa fuselage side. Use epoxy or Zap, not contact cement.

3. Mark the position of each bulkhead directly on the fuselage sides.

4. Mark the wing cutout area directly on the fuselage side. This entire section will be removed and permanently attached to the wing after fuselage build-up has been completed.

5. Glue bulkheads F1, F2 and F3 to the right-hand fuselage side, ensuring each is on the marked position and perpendicular to the fuselage side.

6. Add the left-hand fuselage side, but before permanently gluing, temporarily tape the rear ends of

the fuselage sides together so they're aligned exactly with each other. This will reduce the potential for building a twist into the fuselage.

7. Add bulkheads F4, F5, F6 and F7. Depending on the hardness of the balsa stock you've selected for the fuselage sides, you may have to wet the outside surface to allow it to be more easily pulled together at the tail.

8. After the glue joints have dried, remove the tape and add a scrap piece of trailing-edge stock to the rear where the fuselage sides are joined.

9. Now add upper formers F1A, F2A, F3A, F3B, F3C and F5A, followed by the $\frac{3}{16} \times \frac{3}{16}$ hard-balsa stringers.

10. Block-sand the stringered areas to provide a smooth contour to which the $\frac{3}{32}$ " medium/soft balsa sheeting may be attached.

11. Add all upper $\frac{3}{32}$ " balsa sheeting. Wetting the outside surface will allow it to more easily conform to the shape of the formers.

12. Sand the surfaces to blend all the joints.

13. Cutting along the previously made wing cutout marks, remove the cockpit section from the main fuselage.

14. Install the $\frac{1}{2} \times \frac{3}{4}$ " hardwood landing-gear block. Use a short, scrap length of this block as the vertical receptacle for the gear wire. This block should be epoxied between the main block and the $\frac{1}{32}$ " ply fuselage doubler.

15. For the landing-gear struts, bend $\frac{1}{8}$ " music wire to the shape shown on the plan. The two struts are identical.

Note: the track of the model's landing gear has been widened to improve ground-handling characteristics. As a result, the gear is "springy," and this becomes evident on hard arrivals (landings). If you think you'll find this bothersome, two alternatives are available: (a) narrow the track by using the more scale-like, but more difficult to bend accurately, gear strut shown on the plan, or (b), use $\frac{5}{32}$ " music wire rather than the $\frac{1}{8}$ " indicated for the more conventionally shaped gear.

16. Drill a hole of the correct size (this will depend on the diameter of the wire you've chosen for the gear struts) through the landing-gear block and into the hardwood vertical receptacle.

17. Permanently install the landing gear with gear straps and screws.

18. Add $\frac{1}{4}$ " balsa triangle-stock reinforcement to the rear side of firewall F1.

19. Coat the inside of the fuselage from F1 to F3 with resin for fuel-proofing.

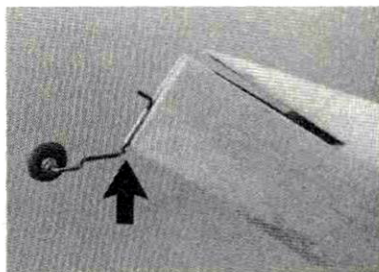
20. Add all the $\frac{1}{16}$ " balsa lower-fuselage sheeting and rear filler sheet, which extends from F7 to the tail.

21. Install the two $\frac{1}{4}$ " ply wing-attachment blocks between F3 and the fuselage sides, the four hardwood triangle blocks that serve as attachment points for the radio/servo tray, and the rear wing attachment-tube guide and its support block. Run a drill bit through the tube guide to make a hole in the lower fuselage sheeting.

22. Finish fuelproofing the fuel-tank compartment by coating the recently added lower sheeting with resin.

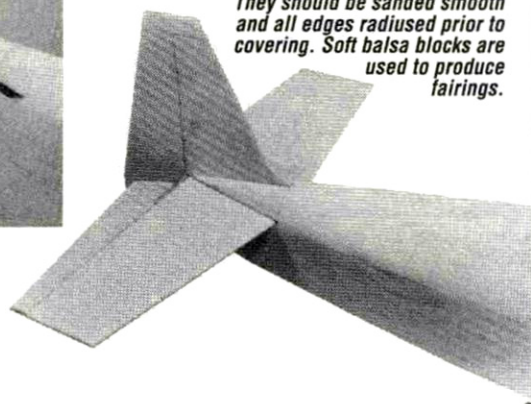
TAIL-GROUP PREPARATION

1. Cut the stabilizer, elevators, vertical fin and rudder out of medium/soft $\frac{3}{16}$ " balsa to the outlines shown. Note grain orientation of parts.
2. Embed $\frac{1}{8}$ " lite-ply inserts into rudder and one elevator half, as shown on plan. They should be installed flush with the surface to which the control horn will be attached; the "thickness gap" on the opposite side of the surface should be filled with scrap $\frac{1}{16}$ " balsa and sanded flush.
3. Join the elevator halves with $\frac{3}{32}$ " music wire bent to the shape shown on the plan.
4. Round all the edges of the tail group by carefully sanding to a center line drawn around the edge of the part.



Tail-wheel strut is $\frac{3}{32}$ " music wire inside a strip aileron nylon bearing. Soldered washer (arrow) reduces load on rudder.

Tail group consists of solid $\frac{3}{16}$ " sheet-balsa surfaces. They should be sanded smooth and all edges radiused prior to covering. Soft balsa blocks are used to produce fairings.



JOINING THE WING TO THE FUSELAGE

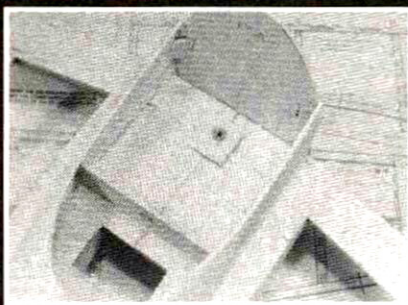
1. Position the wing in the fuselage cutout, and temporarily secure it with pins, tape, or clamps after aligning its center line with that of the fuselage.
2. Drill a $\frac{1}{16}$ " pilot hole through the upper sheeting of the wing, the filler blocks and the $\frac{1}{4}$ " ply attachment blocks in the fuselage.
3. Using the same bit, drill upward through the rear guide tube, the wing trailing edge and the $\frac{1}{8}$ " ply/scrap TE-stock attachment point.
4. Remove the wing from the fuselage, and install the three 4-40 blind nuts—one in the upper surface of the attachment point on the wing near the trailing edge, the other two on the lower surface of the $\frac{1}{4}$ " ply blocks in the fuselage.
5. Enlarge the forward two pilot holes to accept the aluminum tube bushings that are 1" long and are to be installed flush with the lower wing skin.
6. Attach the wing to the fuselage using two 4-40x $\frac{1}{2}$ " socket-head machine screws at the front and a 2 $\frac{1}{2}$ " length of 4-40 threaded rod at the rear. Solder a small wheel collar on the end

of the threaded rod, and cut a slot in it to accept a screwdriver (unless, of course, you can find a 2 $\frac{1}{2}$ " 4-40 screw. I couldn't!)

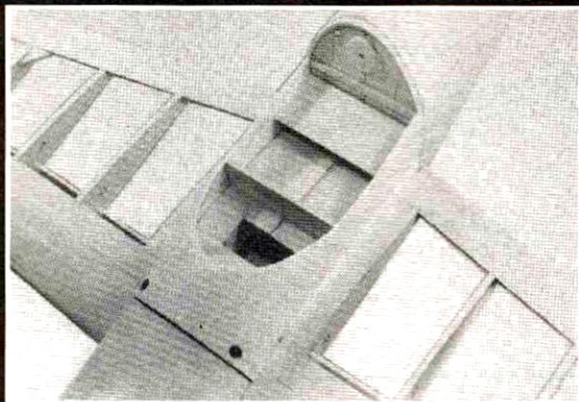
7. Trial-fit the cockpit section of the fuselage to the wing. When satisfied with the fit, glue it permanently into place and sand to blend together. Fill any gaps between the fuselage and rib W2A with scrap sheet balsa. Allow sufficient clearance for covering material.

8. Drill two small holes in the upper sheeting directly above the socket-head hold-down screws. Enlarge these holes just enough to allow insertion of a ball driver into the screw heads.

9. Remove the wing from the fuselage.

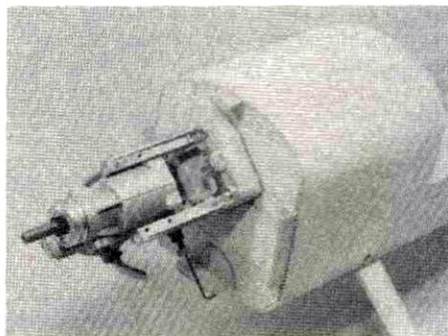


Above: a 4-40 blind nut is used to secure the trailing edge of wing. Note that the cockpit section of the fuselage has been permanently attached to the wing. Add scrap gussets to strengthen joint between F5A and fuselage side. Left: wing mounted on fuselage. Access to forward attachment screws (4-40) is through small holes just aft of joint line.



ENGINE INSTALLATION

Owing to the wide variety of suitable engines (types and sizes) for the Extra 3.25, I designed it with the firewall (F1) positioned sufficiently far aft to accept nearly any powerplant. This requires that a spacer of some sort—I call it a "sub-mount" on the plan—be incorporated to establish the correct spinner-



Engine mount is attached to a spacer (sub-mount) to stand it away from the firewall. Use your engine/mount assembly to determine proper thickness.

to-cowl relationship. The spacer can be made as shown on the plan or simply cut out of a block of scrap hardwood of the required thickness. To determine the thickness of the spacer, attach your engine to the mount of your choice, lay this assembly over the plan, line up the spinner backplate with the engine's drive washer, and measure the distance between the rear face of the engine mount and F1.

The rear end of the cowl can be trimmed to accommodate any minor dimension differences. The three hardwood cowl-attachment points should be added to F1 at this point. If you plan to use the vacu-formed cowl I offer as part of a plastic set (along with wheel pants and clear canopy), recess them about $\frac{1}{16}$ " from the exterior edges of the fuselage. If you choose to build up the cowl out of balsa block, recess the mounts to the required dimension.

FINAL ASSEMBLY

The light, but rugged, structure of the Extra is the key to its performance—nothing exotic, just time-proven techniques applied to a contemporary airplane.



1. After inserting a length of $\frac{3}{32}$ " music wire into a nylon aileron bearing, bend the wire to form the tail-wheel strut, and cut a slot in the aft end of the fuselage to accept the bearing. Remove until covering has been completed.

2. Add soft balsa blocks to rear of F7 to form fairings between vertical fin and stabilizer.

Carve and sand to shape.

3. If you've decided to install wheel pants, use the method shown on the plan. If you've chosen to use my vacu-formed offerings, join the two plastic halves, add $\frac{1}{8}$ " ply plates to the recesses, and they're ready to accept the mount-

ing screws shown in the attachment method.

4. Laminate balsa to form the fairings for gear struts. Sand to oval shape and seal wood with resin.

5. Make a cowl out of balsa sheet or block. Polystyrene foam may also be carved to shape, covered with fiberglass/epoxy resin and the foam dissolved with acetone or gasoline, leaving a fiberglass shell for you to finish. Alternatively, since I've already done all that hard, messy work, you can trim the vacu-formed part, open up all the holes for cooling, needle valves and such, and fit the cowl to the front of your airplane. Remember to install the engine first. With the cowl installed, lightly sand the balsa to blend with the cowl, if necessary.

6. Remove the cowl and engine, fuelproof the firewall and cowl attachment blocks with a coat of resin.

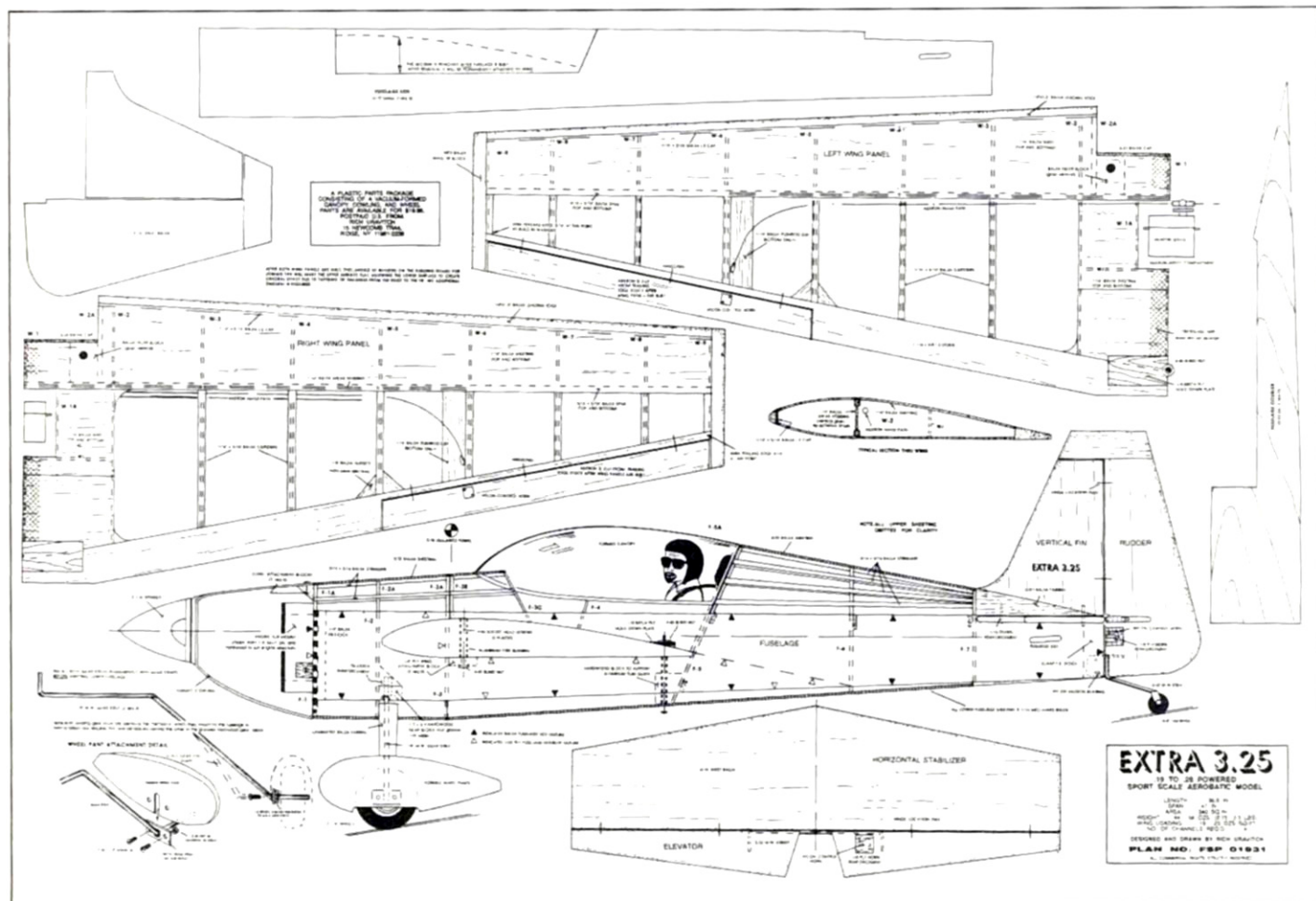
COVERING

The choice of covering for the Extra is up to you. My prototypes were covered with iron-on films; one with TF Super MonoKote*, the

other with Carl Goldberg Models* Ultracote. They are both easy to use, light and offer a great variety of colors from which to choose. All Extra 300s, including the new ones,

seem to have the same paint scheme in nearly the same colors: dark blue (almost black) and red with white trim.

Here's your chance to explore your artsy

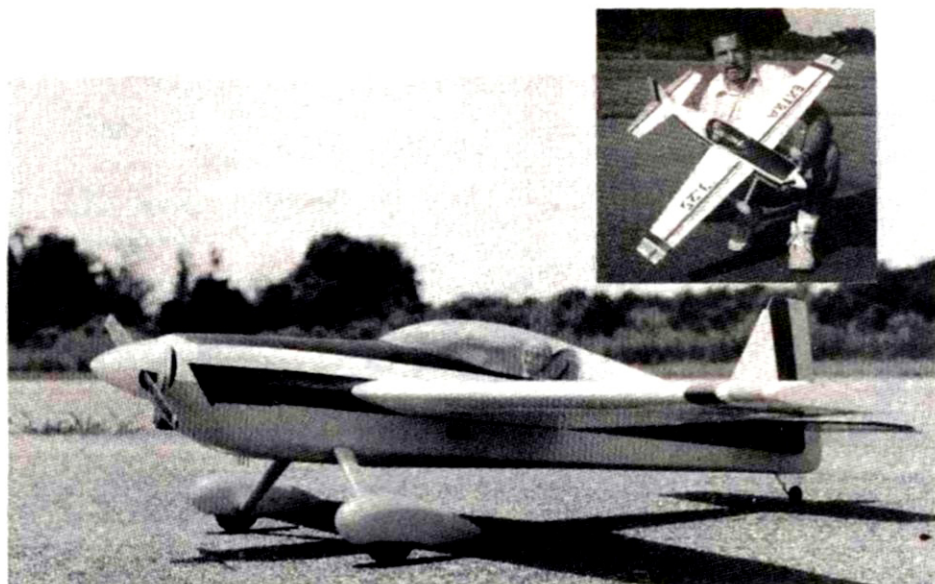


creativity: apply the paint scheme and colors that *you* want! Before you cover the airframe with *anything*, however, be sure to fill all the little dings, final-sand the entire airframe until it's as smooth as you can get it, and then vacuum or "tack-rag" it to remove all the sanding dust that went into the grain; it will prevent the covering from bonding to the balsa as well as it can.

RADIO INSTALLATION

The mid-wing configuration of the Extra cuts deeply into what would otherwise be a spacious radio compartment. Although using miniservos, mounted conventionally, would be easiest, I wanted the design to be as appealing as possible to the largest number of sport modelers. This meant using standard-size servos and not making miniservos necessities.

The solution comes in the form of a servo tray that has the servos mounted on their sides between hardwood posts and held by $\frac{1}{16}$ " ply strips anchored to the posts by two screws. The method works like a charm with $\frac{1}{8}$ " square pieces of balsa glued to the tray to form a frame to prevent each servo from shifting. It's simple and much more positive than the use of the double-sided tape used by some modelers.



The Extra is all dressed up and ready to go.

flat black or gray; add a Williams Bros.* pilot bust (or two; this is a two-place airplane, remember) and seal him (them) in by adding the canopy.

Install a fuel tank of the appropriate size for your engine (there's room for a Sullivan* 6-ounce Slant Front). I recommend the use of a three-line fuel system (unless you want to cut holes that are larger than necessary in the

- Ailerons— $\frac{3}{16}$ " up and down (from neutral)
- Elevator— $\frac{1}{4}$ " up and down (from neutral)
- Rudder— $\frac{1}{2}$ " left and right (from neutral)

BUT DOES IT FLY?

I always look on the first flight of any airplane with some trepidation. (This includes kits as well as my original designs.) There's always that gnawing in the pit of the stomach that raises the question, "Did I do this or that right?" Concluding that I could only be just so thorough before it started to be an excuse to avoid the inevitable, I decided that it was time!

About the only thing that was wrong with the first hop was that I had incorporated too much elevator throw and, as a result, the model was very pitch-sensitive. The radio I had installed was of the "no-frills" variety—no dual rate or exponential—so I made the throw adjustment mechanically at the servo output arms and elevator control horn and ended up with the throws shown here.

The model now flies very smoothly, is quite aerobatic and really fun to fly! The O.S. 4-stroke hauls it along briskly, but quietly, at just over half throttle. The washout in the wing keeps the stall gentle and straight ahead and makes landings a pleasure rather than an adventure. The Extra 3.25 is small, sporty and slick; you really should build one. After all, don't we all deserve a little Extra?

**Here are the addresses that are pertinent to this article:*

Rich Uravitch, 15 Newcomb Trail, Ridge, NY 11961-2238; (516) 929-4132.

Zap; distributed by Frank Tiano Enterprises, 15300 Estancia Ln., W. Palm Beach, FL 33414.

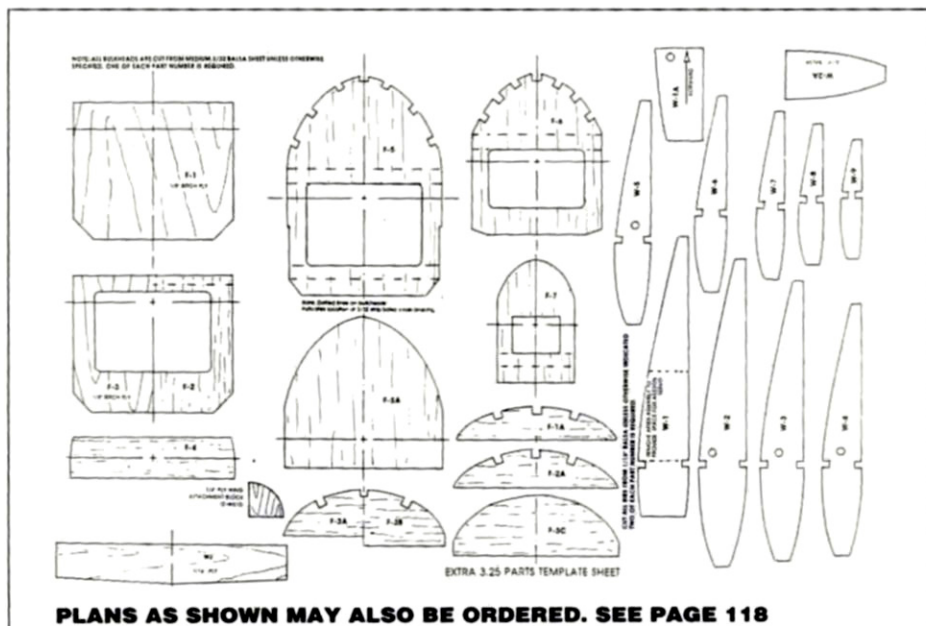
MonoKote/Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826.

Carl Goldberg Models, 4734 West Chicago Ave., Chicago, IL 60651.

Williams Bros., 181 Pawnee St., San Marcos, CA 92069.

Sullivan Products, P.O. Box 5166, 1 North Haven St., Baltimore, MD 21224.

O.S./Great Planes Model Distributors.



PLANS AS SHOWN MAY ALSO BE ORDERED. SEE PAGE 118

The rudder and elevator pushrods are $\frac{1}{4}$ " dowels with wire ends. The aileron servo also is mounted on its side in the wing center section; it drives a cable that's connected at each end to an aileron control horn.

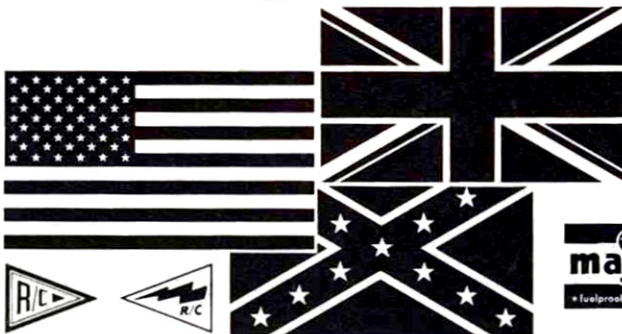
DRESS-UP AND PREFLIGHT CHECKS

Now it's time to add all the little bits and pieces of hardware and dress-up items that you want. Paint the inside of the cockpit area

cowl to let you get to the carburetor each time you refuel). Add the prop, spinner and wheels, and you should be nearly in business.

With an O.S.* .26 Surpass 4-stroke engine and a 500mAh battery installed below the fuel tank, my original Extra required no additional ballast to get the CG where it belonged. Its all-up weight (dry) is 50 ounces. Recommended starting points for control-surface deflections are:

Be a Flag waver!!



4 Sizes per
sheet
& MORE!

Send \$3.00
for brochure

major decals
• fuelproof • water transfer • pressure sensitive

NORTHEAST SCREEN GRAPHICS 21 FISHER AVE., EAST LONGMEADOW, MA 01028 TEL: 413-525-4110 FAX: 413-525-7794

Electric Performance pure and simple...

APACHE

\$59.95 List

Wingspan - 44" Area 340 sq. in.

Weight - 10.5 oz. airframe only. 38 oz. ready-to-fly.

Radio - 4 Channel

Power Requirements - .05 electric motor or .09 to .15 glow engine.

All AEROCRAFT kits are engineered for outstanding flight performance. Kits include machine and die cut parts from select balsa and plywood, premium hardware packs, illustrated instructions, and rolled plans.

AEROCRAFT

P.O. Box 553, East Northport, NY 11731 • (516) 754-6628

See your hobby dealer first. If he doesn't stock AEROCRAFT kits, order direct.

Include \$2.50 S&H with direct order

Make Your Hirobo Shuttle Z/ZX Even Better !!!

Make Your Hirobo Shuttle Z/ZX
Even Better !!!

For the Novice or Competition Pilot!



Little Known Hints and Tips from Shuttle Pilot

All Upgrades and Accessories

Make Your Shuttle Fly More Stable

Increase Aerodynamic Capabilities

Setup and Repair Hints and Tips

PLUS... Much More !!!

By Glenn R. Cassano



Whether you're a novice or competition pilot this book is for you. It's packed with information such as:

- Making the Shuttle more stable
- Making the Shuttle more aerobatic
- Setup and repair tips and hints
- Upgrade and accessory information

PLUS Much More!!!

Order today at the introductory price of only **\$ 8.95** (includes shipping)

GRC Publications
6 Londonderry Commons Ste 230N
Londonderry, NH 03053

Dealer Inquiries Welcome

Proctor Museum Scale Kits

Acknowledged as the world's finest. Each comes complete with all hardware, fittings, rolled plans and concise construction manual. Enjoy building the same models that are displayed at nearly every major aviation museum. But don't forget, they fly great too!

| | | | |
|-----------------|-----------|----------|--------|
| Nieuport 11 | 1/5 Scale | 61" Span | 279.95 |
| Nieuport 28 C-1 | 1/4 Scale | 80" Span | 398.95 |
| Curtiss Jenny | 1/6 Scale | 86" Span | 398.95 |
| Albatros DVA | 1/4 Scale | 89" Span | 695.00 |

Proctor Antics

Lou Proctor founded the company on this classic design and it continues to be an all time favorite. Choose from six different versions. Proctor quality starts as low as 109.95.

| | | |
|------------------------|----------|--------|
| Mini Antic Monoplane | 56" Span | 109.95 |
| Mini Antic Biplane | 56" Span | 159.95 |
| Antic Monoplane | 81" Span | 169.95 |
| Antic Parasol | 76" Span | 189.95 |
| Antic Biplane | 64" Span | 209.95 |
| Antic Biplane Seaplane | 64" Span | 269.95 |

VK Scale Kits

These models represent an outstanding value for the scale enthusiast. Each comes complete with all hardware, finished cowl, rolled plans and manual. If you are considering the move to WWI Scale, these kits are a great place to start.

| | | | |
|---------------|-----------|----------|--------|
| Fokker DRI | 1/6 Scale | 47" Span | 149.95 |
| Sopwith Camel | 1/6 Scale | 56" Span | 149.95 |
| Nieuport 17 | 1/6 Scale | 54" Span | 149.95 |



Curtiss "Jenny"

Plans by R. Beck

Engines • Hardware • Accessories

In addition to our kit line we also manufacture and stock the world's largest selection of hardware and accessories for your vintage aircraft needs. We are also the exclusive U.S. distributor for Laser and Seidel Radial Engines.

Catalog: 4.00 • Shipping: 9.75 per kit, 15.00 for Albatros DVA and Nieuport 28 C-1. Overseas rates by request.

Proctor Enterprises 25450 N.E. Eilers Rd. Aurora, OR 97002

U.S.A. Phone: (503) 678-1300

Fax: (503) 678-1342

VISA and MasterCard accepted.

PROCTOR

Semi-scale Cessna



BY GEORGE JENKINS

GLOBAL Skylane -45 to .61

GLOBAL'S* SKYLANE .45-.61 is large and very easy to see in the air, but I wouldn't consider it a rank beginners' kit. Its large, tapered wing has an airfoil that changes from semisymmetrical at the center of the wing to flap-bottom at the tip. This gives it a broad speed range that offers very stable flight from takeoff to landing.

In the kit, I found a lot of wood, and the die-cutting was fair. The balsa was hard to medium-hard, which ultimately contributed to the model's weight. I sanded the balsa as much as possible, and my Skylane came out at 7 pounds. I installed a good, strong O.S.* 45 FSR engine with an APC* 10x7 prop as instructed, but I think a .60 would also give great flight performance.

GETTING STARTED

I started by reviewing the plans and reading the instruction manual. I sprayed the plans lightly with adhesive and stuck them onto my Formica building surface. Then, I stuck wax paper over the plans in the same manner. A final spray on top of the wax paper prevented the parts from moving and eliminated the need to pin them down. A piece of thick glass, which provides a very true, flat building surface, will work just as well.

Model name: Skylane
Manufacturer: Global Hobbies
Type: Intermediate trainer
Price: \$89.95
Wingspan: 71 inches
Wing area: 700 square inches
Weight: 7 pounds
Length: 54 inches
Engine sizes recommended: .45 to .61 2-stroke
Engine used: O.S. 45 FSR
No. of channels req'd: 4 (ailerons, rudder, throttle, elevator)
Prop used: APC 10x7

Airfoil type: Semisymmetrical, changing to flat bottom at wing tip
Washout built into wing? Yes
Wing construction: Balsa, ply, spruce
Kit construction: Balsa, ply with plastic cowl/wheel pants

Features: vacu-formed cowl and window, wheel pants and basic hardware; aluminum main landing gear and formed nose-wheel strut; machined and

die-cut wooden parts and some pre-built bulkheads that speed construction.

Hits

- Good flight characteristics
- Very strong construction
- Good, scale-like appearance
- Discount price: \$59.99

Misses

- Aileron stock is too thin; it doesn't match the thickness of the main wing.

S
P
E
C
I
F
I
C
A
T
I
O
N
S

BUILDING THE SKYLANE

Construction begins with the horizontal stabilizer. I thought it was on the heavy side, so I sanded it down a lot and used Zap* adhesive for strong, light glue joints. The vertical fin is next, and it's a built-up affair. After sanding it to shape, I covered all the tail parts and hinged them together with Sig's* EZ Hinges (nothing unusual here).

FUSELAGE CONSTRUCTION

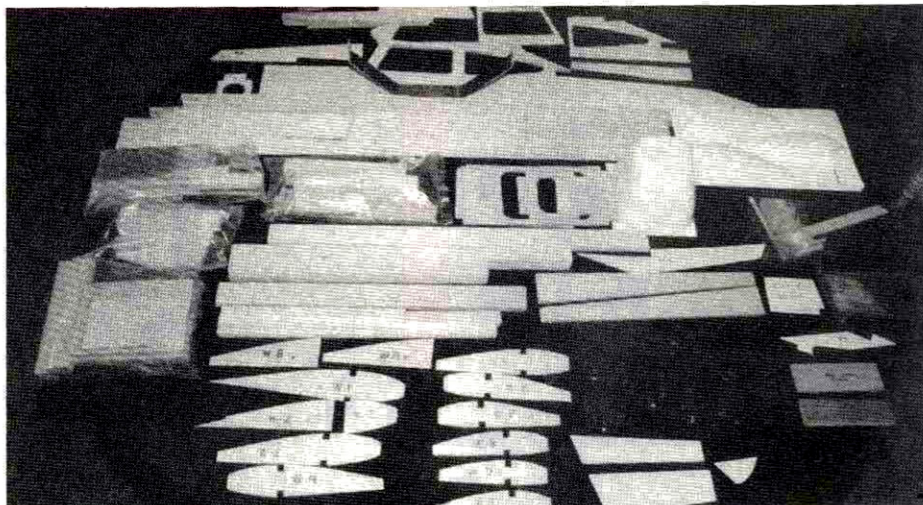
The fuselage uses a lot of plywood for strength, which is appropriate for a trainer. However, sand and carve away as much wood as you can to make your Skylane as light as possible. The instructions recommend that you glue the top hatch into place before the motor mount, nose gear and throttle cable are installed. I waited until everything had been installed before I glued the hatch on; this made the job much easier. I used a J'Tec* muffler so that the engine could be completely cowled with only the head fins sticking out for a great scale-like appearance. I also used a glass-filled Kraft* Hayes engine mount and mounted the engine horizontally with the exhaust facing downward. I use Nyrods for the throttle and nose gear linkages. However, I use solid-balsa pushrods on the rudder and elevator because Nyrods expand and contract with temperature variation, and this can cause trim changes in the model. I use a Sullivan* 12-ounce tank and put a tank floor under it. I installed a Model Aviation Technology* 1200mA, lead-acid, gell-cell receiver battery under the tank floor. Be sure to fuelproof the tank and nose areas with polyester resin.

I used Sig wheel pants mounts and Zap-a-Dap-a-Goo glue to hold the wheel pants in place. The windshield and side windows included in the kit weren't perfect fits, which was a disappointment. The manufacturer could do better. Again, I used Zap-a-Dap-a-Goo to install these.

The Skylane kit has many pieces, and the use of plywood in some areas is overkill. I think the model could have been designed to be simpler and lighter, and it still would have been strong enough to be a good sport machine.

BUILDING THE WING

The wing has four spruce spars and plywood dihedral braces designed to fit between them. I added 1/6-inch plywood reinforcement plates to the front and back of the dihedral brace. The wing is nice-looking, but a little hard to build because of the change in airfoil from root to tip. The ailerons are made of tapered stock, but they're a little too thin, and in my kit, they



The kit is easy to build and its pieces fit together well.

didn't match the thickness of the main wing sub-trailing edge. The wing plan shows a typical 90-degree bellcrank control system, but to simplify construction, I installed a servo in each wing panel and connected the servos directly to the ailerons. The servos work together with a Y-harness off the aileron channel. Either setup will give good control response.

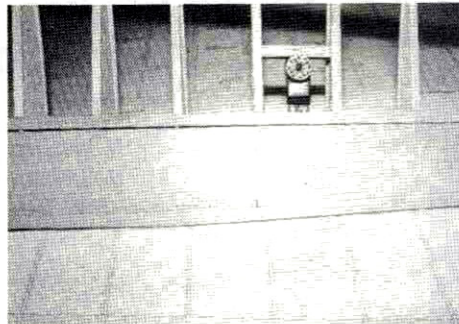
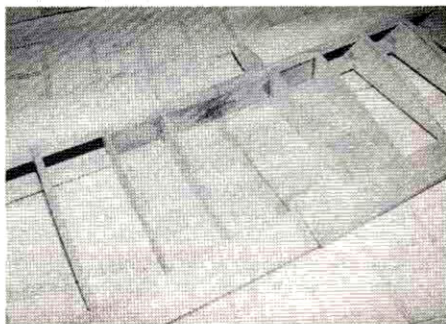
FINAL ASSEMBLY

I glued the fin and stab to the fuselage and covered it with Coverite's* new Century 21 Space Age fabric. Heat setting is critical, so

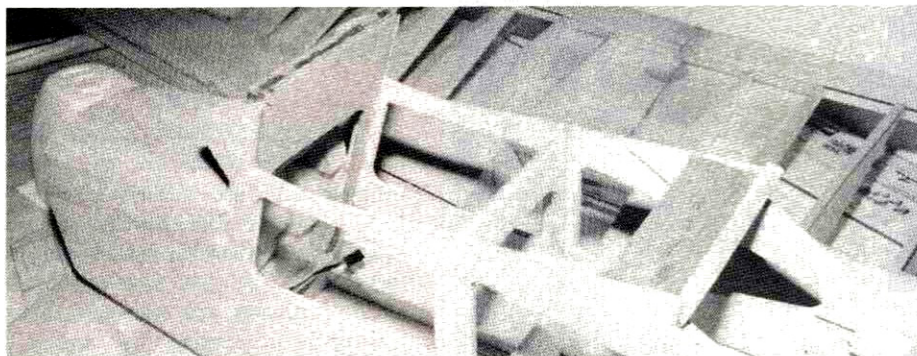
follow the directions, and use a thermometer to set your iron. The material gives a nice, fabric-covered look to the model, and adds to its beauty.

If you decide to build the Skylane for yourself, you'll be pleased with the compliments it receives, and with its "flyability."

I used Century 21's matching paint on the formed-plastic wheel pants and cowl. A few



Left: the dihedral brace fits between the strong upper and lower spruce spars. Right: even though the plan instructs you to use bellcranks for the ailerons, you may wish to install servos in the wings. Servos will eliminate slop and simplify construction.

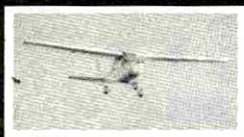


The Skylane's strong fuselage construction makes it an ideal intermediate trainer. The formers are all plywood.

FLIGHT PERFORMANCE

• Takeoff and landing

Cross-wind takeoffs are easy with the Skylane's big rudder. Because of its steerable nose gear, the plane tracks straight down the runway. It takes off easily with a .45 engine. On landings, the long wings increase stability, and I observed no tip-stalling tendencies on the landing approach. The plane is easy to see and it sets-up in a nose-high attitude for landings. There's no need to panic during dead-stick landings, either. On the first flight, I ran out of fuel and landed dead-stick without a problem. Since the wing develops so much lift, only a little up-elevator is needed for both take-off and landing.



ability, and I observed no tip-stalling tendencies on the landing approach. The plane is easy to see and it sets-up in a nose-high attitude for landings. There's no need to panic during dead-stick landings, either. On the first flight, I ran out of fuel and landed dead-stick without a problem. Since the wing develops so much lift, only a little up-elevator is needed for both take-off and landing.

• Slow-speed performance

The model has no bad habits in slow flight. It can be slowed without fear of a tip stall with some back pressure on the elevator stick. When the model does stall, it just drops its nose and continues to fly.

• High-speed performance

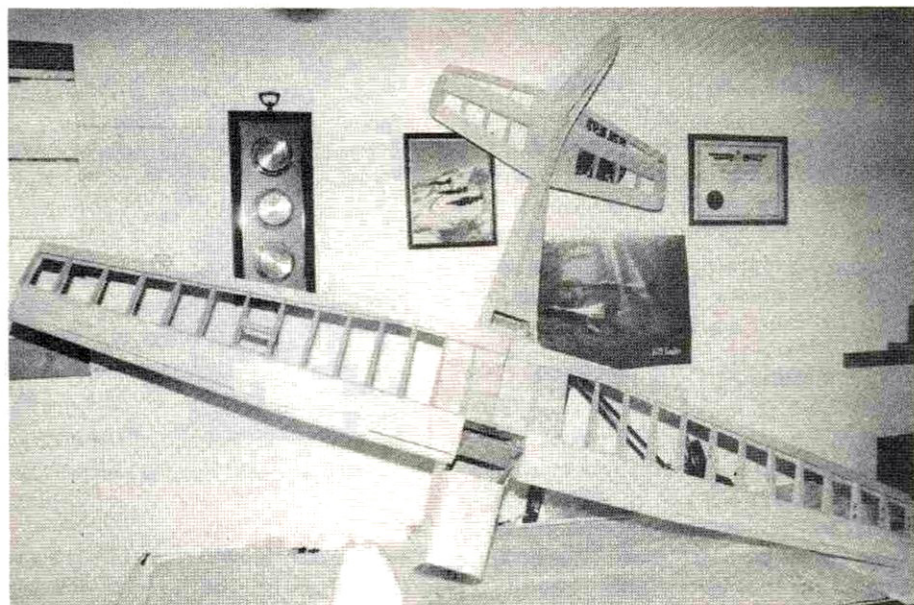
The plane is so clean that it easily penetrates the wind; it's easy to overshoot the landings if you're not careful! The Skylane really moves out despite its size and weight. On high throttle, it flies too fast for a trainer; it should be flown at half-throttle for the best performance. The plane gets a little twitchy in high-speed turns, but it tracks well and it has great vertical performance. It doesn't slow down or mush out on climbing turns. Some models just don't look as if they're flying fast, and on high throttle, the Skylane is one of them. A fair amount of down-trim is required at higher speeds—as expected with any high-wing, high-lift, airfoil-equipped model.

• Aerobatics

The plane is aerobatic, but you could enter a high-speed stall situation if elevator travel is too great. The Skylane can do far more than its full-size counterpart ever could. It flies as well inverted as it does right-side-up, and it requires only a little down-elevator to maintain level flight. I enjoy the model's predictable feel and its smooth roll rate. Its inherent stability doesn't allow it to snap-roll very well, nor will you get a very flat spin (we're talking about a Cessna here!). I recommend that the model be built as lightly as possible to get the best aerobatic performance from it. If it comes out on the heavy side, you could put in a .60 engine; the wing and fuselage are strong enough to handle the extra power.



SKYLANE



The Skylane has a 71-inch wingspan and 700 square inches of wing area. The plane is shown here, ready to cover.

words of caution: the paint sprays very thinly and can run easily. I recommend that all plastic parts be sanded first, and then sprayed lightly with paint. The second coat will cover better and it won't run. I trimmed the model with 3M auto trim tape and applied it around

This is a good stand-off-scale model that does every maneuver. On the first flight, I put it right on the deck and close up. My wife was delighted to see it fly after all those nights I had spent in the workshop. It even flew inverted with no problems.



Note the Skylane's pleasing lines. Mount the engine horizontally and use a compact muffler so that you can almost totally enclose the engine.

the windshield. It sticks to the fabric very well. Over decals or graphics, use a light coat of Coverite's Black Baron high-gloss or flat, clear paint for fuelproofing.

FLYING

At 7 a.m. at the Sarasota Squadron flying field here in Florida, the Skylane flew great right off the board. I used my Futaba* 9-channel PCM radio (only four channels were used). There's lots of room for radio installation. I installed the 10x7 APC prop with a 2-inch, Du-Bro* spinner, and the model balanced right on the CG specified by the plans. The .45 engine provides plenty of power. I was amazed at how well the Skylane flew and at how good it looked in the air.

Then, it was time for the first landing. I kept the flying speed up, and it went down the runway into a three-point, controlled touchdown. I adjusted the low-speed throttle setting and the plane went back up. I tried to stall it, spin it, roll it and make it do slow flybys; the plane did it all. If

you decide to build the Skylane for yourself, you'll be pleased with the compliments it receives, and with its "flyability."

**Here are the addresses of the companies that are mentioned in this article:*

Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728; (714) 964-0827.

O.S.; Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826.

APC Props, P.O. Box 938, Knights Landing, CA 95654.

Zap; distributed by Frank Tiano Enterprises, 15300 Estancia Ln., W. Palm Beach, FL 33414.

Sig Mfg. Co., 401 S. Front St., Montezuma, IA 50171.

J'Tec, 164 School St., Dale City, CA 94014.

Kraft Midwest Inc., 115 E. Main St., Northville, MI 48167; (313) 348-0085.

Sullivan Products, P.O. Box 5166, 1 N. Haven St., Baltimore, MD 21224.

Model Aviation Tech., 12848 Touchstone Pl., Palm Beach Gardens, FL 33418; (418) 626-6955.

Coverite, 420 Babylon Rd., Horsham, PA 19044.

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.

Du-Bro Products, 480 Bonner Rd., Wauconda, IL 60084. ■

1/3-SCALE CUB

(Continued from page 73)

engine will usually come on line in about three flips.

When you're used to its size, you'll find that the model is a real pussycat to fly. Test pilot Dave Baron compared flying the model to pushing a big baby carriage. Whenever you have an easy-flying model that's true to scale, impressive in size and can be considered a "warbird," you know you have a winner. Build your own copy of this fighting Cub and join The L-4 Wing. No matter what color you paint it, it's always a classic!

*Here are the addresses of the companies that are mentioned in this article:

Balsa USA, P.O. Box 164, Marinette, WI 54143.
Robert Mfg., P.O. Box 1247, 310 N. 5th St., St. Charles, IL 60174.

Indy R/C, P.O. Box 40116, Indianapolis, IN 46240.
B&B Specialties, 14234 Cleveland Rd., Granger, IN 46530.

Sullivan Products, P.O. Box 5166, 1 North Haven St., Baltimore, MD 21224.

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.

Fiberglass Master, Rt. 1, Box 530, Goodview, VA 24095.

Ace R/C Inc., 116 W. 19th St., Box 511C, Higginsville, MO 64037.

Wicks Aircraft Supply, 410 Pine St., Highland, IL 62249.

Vailly Aviation, 18 Oakdale Ave., Farmingville, NY 11738; (516) 732-4715.

Badger Air-Brush Co., 9128 W. Belmont Ave., Franklin Park, IL 60131.

Aeroloft Designs, 2940 W. Gregg Dr., Chandler, AZ 85224.

Officers and Gentlemen, P. O. Box 537, RD 2, Hampton, NJ 08827.

Scale Aviation, 34 Ward Parade, Stirling Point, Bluff, New Zealand

FUN-FLY NATS

(Continued from page 65)

Gilbert (1st) and David Grantham (2nd) used Enya .35s, Chris Plumley (3rd) and Jerry L. Smith (5th) Webra .32s, and Jeff Welter (4th) an O.S. .45.

Wingspans seem to be shrinking slightly. At last year's competition, many of the planes had a span of 48 inches. This year, four planes had 42-inch wingspans, twelve planes had 44-inch wingspans, eleven planes had 46-inch wingspans, and only seven planes had 48-inch wingspans. The top five winning planes all had 44-inch wingspans.

Fourteen airplanes weighed between 2 pounds, 12 ounces and 2 pounds, 2 ounces; thirteen planes weighed between 2 pounds, 13 ounces and 3 pounds, and eight weighed more than 3 pounds. Of the winning planes, the top two weighed 2 pounds, 6 ounces, and the 3rd-, 4th- and 5th-place planes weighed 2 pounds, 9 ounces; 2 pounds, 14 ounces; and

2 pounds, 11 ounces, respectively. Clearly there is a message here, as four of the winning planes weighed less than 2 pounds, 12 ounces, i.e., were in the lowest weight category.

As for propeller size, seventeen flew with 10x5 props, nine with 10x4 props, four with 11x4 props and one with an 11x5. Four of the top five competitors used 10x5 props.

Nearly all contestants used homemade tuned-pipe mufflers constructed of ultralight materials such as mousse cans. Eighteen pilots used 15-percent nitro, seven used 10 percent, five used 25 percent and one, 30 percent. Of the five top winners, two used 25 percent, and three 15 percent. Nearly all competitors used full-house mixing that included elevator/flap coupling and spoilers. (See November's *Simple Programming* column by David Baron for an introduction to competition fun-fly mixing, and see subsequent columns on the use of different radios in fun-fly ships.)

As for airfoils, there was a tremendous variety. They ranged from nearly flat-bottomed to severely angled leading edges to fully symmetrical. All were very thick, and most had very blunt leading edges. Fourteen competitors flew Coal Haulers (a third were

(Continued on page 88)

L&R Aircraft Ltd.

The Next Generation of High-Performance, Sport & Aerobatic Aircraft

"THE AIRTRAX SERIES"

See your dealer first; if he can't or won't assist you, call direct!

Available in 3 sizes

- P-Series 51"
- F-Series 64"
- Q-Series 84"

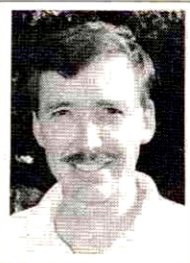
Airtrax .61

"For the money, this is one of the best kits coming from manufacturers today"
RCM, Jan. 1991

75% Prebuilt!

L&R Aircraft Ltd. 13645 Fisher Road, Burton, OH44021 (216) 834-1578 Made in the USA

SIMPLE PROGRAMMING



DAVID C. BARON

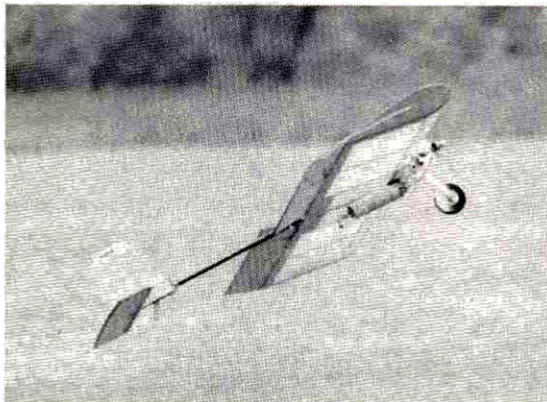
THINKING JR

THIS IS the first of two installments in which I'll explain how to set up the aircraft (ACRO) mode of the JR* X-347 radio. I'll use a competition fun-fly aircraft setup to explain the radio's features. This is valuable information for those who already own this fine radio and want to learn more about it and for those who are about to buy one. Given the depth of the subject, I hope to cover the GLID and HELI sections of the X-347 at a later date.

Unlike other programmable radios, the JR X-347 has two separate flow charts, or "scrolls" as I call them—the System Setting Mode Flow Chart and the Function Setting Mode Flow Chart (see chart). In this article, I'll discuss the System Flow Chart and approximately half of the functions in the Function Setting Mode Flow Chart.

SYSTEM FLOW CHART

You'll always modify the System Flow Chart first when you set up any new plane or heli. The setup establishes the basic structure on which to build all the func-



Competition fun-fly aircraft are the most agile aerobatic R/C aircraft to emerge in years. Computer mixing has made this new trend in the hobby possible. This Smith Special was flown at the 1992 NCFD NATS. (Owner unknown.)

tion programming. System programming is accessed by simultaneously depressing the mode buttons while turning on the radio. In this mode, the radio doesn't radiate any signal. You can return to the normal

mode (where the signal is being radiated) by simultaneously depressing both of the mode keys.

If you become confused during any of my programming steps, refer to your manual. The people at JR have done a good job with it.

As in my previous columns, I heartily recommend that you install the servos and the receiver. The learning process speeds up tremendously if you watch the control surfaces move while you set up the transmitter. Plug the left wing into the AUX 1 port in the receiver and the right wing into the aileron port. The elevator is port 3, the throttle is port 1 and the rudder (if used) is port 4.

The following abbreviations appear on the radio's LCD:

- **MDL. (MODEL)**—This is where you select which of the four different model memories you'll be using. The radio always displays the model that was programmed and/or used last. To change model memories, simply depress the plus (+) or minus (-) data keys.

- **NAME**—As you might expect, this is where you change the model's name that shows in the display. Use the plus and minus data keys to change the letters. Use the CH> key to move to a letter that needs changing.

- **TYPE**—Use the data keys to select the ACRO, GLID or HELI modes.

- **MDL. RSET. (MODEL RESET)**—This data reset function is the fastest way to start reprogramming the parameters for any model. Press the CLR key to reset everything to the original factory settings. It will only reset the

model memory you're currently in.

- **MIX WING**—This poorly named title refers to model configuration. You can choose elevons (for flying wings), flaperons (definitely necessary for fun-fly mixes) and



The JR X-347 offers powerful programming features at a mid-range cost.

normal. Once again, to make a selection, depress either the plus or minus data keys.

- **MODU. (MODULATION)**—To change the modulation type, select either PCM or PPM by using the plus or minus data keys.

- **SPOIL. (SPOILER)**—Spoiler activation selection lets you decide whether to activate the spoiler with a switch (mixing switch) or with a knob (AUX.2 knob). (These are irrelevant for fun-fly mixing when you use the Landing System Function. This function automatically deploys the spoilers at a preset throttle location. This will be described later in the Function Setting Flow Chart.)

- **CPY. (COPY)**—The copy program lets you copy entire aircraft or heli memories to the different model memories. This is especially useful when you want to explore changes to your model's program without worrying about damaging or losing your original setup.

FUNCTION SETTING MODE FLOW CHART

When you access the Function Setting Mode Flow Chart, you won't always enter its scroll in the same place. You'll enter at

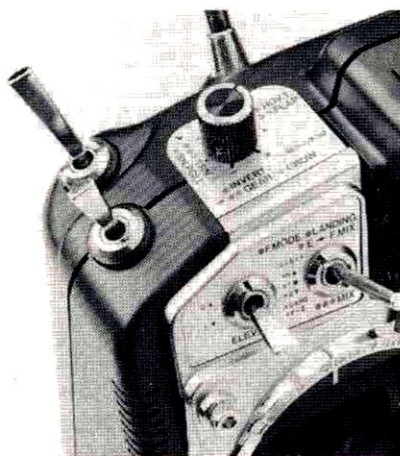
the point where you last exited. This can be helpful if you're modifying a program and need to turn off the radio for some reason. When you access the Function Mode again, you'll enter it at the point where you last exited.

This can become awkward if too much time has passed since you last entered the Function Mode. One of my criticisms of this radio is that the abbreviations are quite short, and it takes some use before they make sense and are instantly recognizable.

SETTING UP THE FUNCTIONS

For simplicity, I'll follow the flow chart as shown on page nine of the manual. For all of the following functions, values are manipulated and changed in the same way. I'll therefore mention this information once at the beginning of this section, and you can apply it to all of the functions that will be discussed. This is covered on pages 11 to 33 of your manual. Throughout the manual, the graphics are excellent, and I urge you to refer to them while you follow these instructions:

1. To enter the Function Setting Mode Flow Chart, first turn the radio on and then simultaneously depress the two mode (up and down) keys.



To use the landing-mode spoiler function, the landing-mode/flap-mode switch (right center) must be down.

FUNCTION SETTING MODE FLOW CHART

| | |
|----------------------|---|
| DUAL RATE | Dual Rate |
| EXP. | Exponential |
| REVERSE SW. | Reverse Switch |
| S. TRIM | Sub Trim |
| T. ADJ. | End-Point Adjustment |
| MIX E-F | Elevator-Flap Mixing |
| LD: | Landing Attitude |
| SNP.R | Snap Roll |
| MIX DIFF | Differential Ailerons/Elevator Settings |
| MIX A, B, C, D | Programmable Mixing |
| FLP.P | Flap Value Adjusting Knob |
| FAL.S | Fail Safe for PCM |
| TRN | Trainer |
| TMR. | Timer |
| INT.T | Accumulated Time of Use |

SYSTEM SETTING MODE FLOW CHART

| | |
|------------------|---------------------------------|
| MDL | Model Change |
| NAME | Input Model Name |
| TYPE | Type Selection |
| MDL. RESET | Data Reset |
| MIX WING | Wing Mixing |
| MODU | Modulation Change PCM/PPM |
| SPOI. | Spoiler Channel Input Selection |
| CPY. | Copy Function |

2. In the Function Setting Mode, depress the up key and follow the sequence presented below. Depress the down key to go backwards through the scroll.

3. When you're in a function that you'd like to manipulate, the CH key changes the channel that's being modified. In the TX display, you'll see the abbreviation for the appropriate channel, e.g., AIL, ELE, RUD.

4. The plus or minus keys change the value in a positive or negative direction for the function you're in and for the specific channel that's shown in the display.

5. The CLR (CLEAR) key always resets the value to the factory presets.

• **DUAL RATE**—This should be familiar to all of you. Pick the toggle-switch position you want for the high rate (up or down), then adjust the rate value. Remember that 100 percent isn't the limit. If you want the most throw possible (and for fun-fly you do), then it's possible for your high rate to be up to 125 percent!

Buried in the rudder section of the dual-rate function is an automatic dual rate for

the rudder. This is for those who want less throw during lower throttle settings, e.g., for taxiing. In the book, the example given suggests that low rates be used for takeoff, so there's no "over-controlling" of the rudder. This doesn't make a lot of sense to me because I tend to use full throttle during takeoff.

• **EXP (EXPONENTIAL)**—Exponential is the fun-fly pilot's best friend because it makes those extreme control throws manageable. JR's approach to control throws is pure common sense: Zero percent is linear throw while 1 to 100 percent is available to reduce the sensitivity of the stick around neutral. While extreme stick deflection still provides full control-surface motion, I recommend starting at 25 percent if you've never flown with exponential rates before.

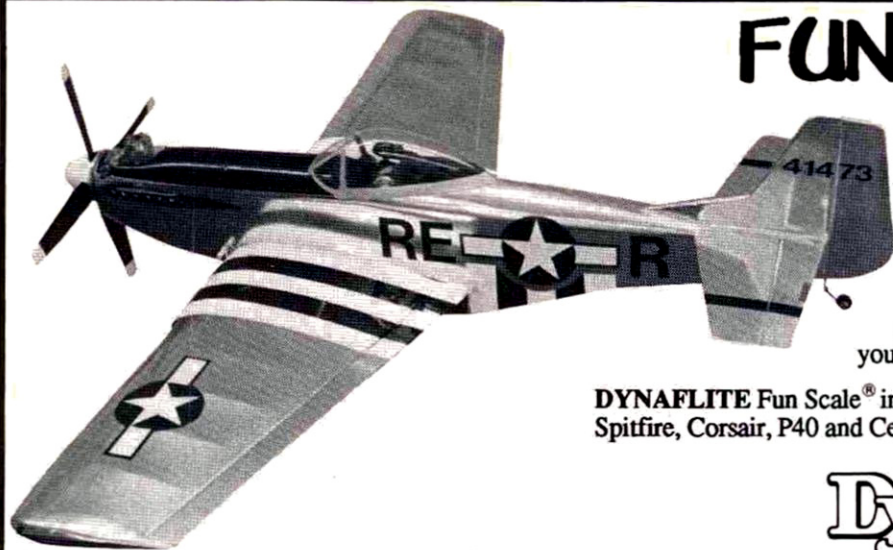
You can assign exponential to both of the dual-rate switch positions, and you can use it in conjunction with the dual rates, e.g., I sometimes use high rate with exponential and don't apply exponential to low rates.

• **REVERSE SW**—There should be no surprises when it comes to switch/servo reversal! Note only that it's imperative to turn on the flaperons in the System Setting Mode flow chart before establishing proper aileron direction. The servo-reversing for the left wing is controlled by the flap or AUX 1 channel, and the right wing is controlled by the aileron channel.

• **S. TRIM (SUB TRIM)**—With sub trims, you can trim your aircraft to a finer degree than the mechanical linkages on your aircraft allow. It's also vital for centering the mechanical trim switches on the face of your transmitter so you can switch to another aircraft and not have to worry that a mechanical adjustment to these switches might have been accidentally left in place

(Continued on page 88)

FUN SCALE®



Ready for a Sport plane that looks like a War Bird and flies like a Trainer?

With our all balsa-and-ply construction and full-size plans you won't need a long winter and an engineering degree to build a plane you're proud to fly.

DYNAFLITE Fun Scale® includes: P51 40 size, P51 60 size, Spitfire, Corsair, P40 and Cessna Trainer.

Dynaflite

FOR FREE CATALOG WRITE TO: P.O. BOX 1011; SAN MARCOS, CA 92069

FUN-FLY NATS

(Continued from page 85)

built from plans, and the rest from kits), five flew Sticks, three flew Smith Specials, one flew a Yard Dart, two flew Hang Gliders and the rest flew home-brewed designs that generally combined the features of the designs noted.

If you want to build your own fun-fly ship, several kits are available. (Manufacturers are listed at the end of the article.)

THANKS

The many contributing sponsors deserve thanks for their support, and particularly the radio manufacturers, who sent expensive programmable radios as awards for the top-ranking winners. Doug Whiteaker, CD, deserves thanks for coordination of the event as well as for chairing the pilot meetings and award ceremonies and managing the competition overall. Our thanks to assistant CD Dennis Green for his behind-the-scenes, but essential,

efforts, to David Bowman, who wrote the scoring program and served as the data processing center, to the several judges and time keepers, and to the members of the Music City Aviators, Middle Tennessee R/C Society, and Columbia RC Flying Modelers who helped make the competition happen. Finally, we would like to express our thanks to the NCFFA, without whose leadership the event would not have been held.

If you enjoy competition, have an eye for design and would like to try your hand at this new sport, I recommend you give it a try. You're guaranteed to have a great time.

For further information on the National Competition Fun Fly Association, write to NCFFA president John von Linsowe, 3976 Green Corners Road, Metamora, MI 48455.

Sources of fun fly designs include:
Florio Flyer Corp. (Coal Hauler), P.O. Box 88, 149 Scotland St., Daguer Mines, PA 15831; (814) 885-8360.
Air Flair (Stick-It V), P.O. Box 2075, Fairborn, OH 45324; (513) 878-7487.
Smith Special Plans, Jerry L. Smith, 3970 Contest Road, Paducah, KY 42001 (502) 554-7413.

Capstone R/C Suppliers (Yard-Dart), 562 West Schrock Rd., Westerville, OH 43081; (614) 899-6313.

The Tadpole (an excellent first ship in this class), Model Airplane News plan no. FSP01921.

Other pertinent addresses:
Solaris; distributed by Hobby Shack, 18480 Bandelier Cir., Fountain Valley, CA 92728-8610.

Bob Violett Models, 1373 Citrus Rd., Winter Springs, FL 32708.

PROGRAMMING

(Continued from page 87)

as you begin to fly the second aircraft, which would then need to be re-trimmed. You should use this function regularly if it's going to be of value to you.

Bear in mind that there are 30 degrees of travel authority in this electronic trim. If you're using all 150 percent of your servos' available travel-adjustment throws, (common on fun-fly aircraft), then you'll begin to see a deterioration in servo-travel extremes if you

(Continued on page 97)

"DE-HINGE", THE BEST AND EASIEST HINGE, JUST GOT EASIER

MACHINED HINGE CROSS SECTION BALSA FILLER BLOCK STOCK NOW AVAILABLE

"DE-HINGE", the FIRST hinge mounted with cyanoacrylate is surface mounted without cutting notches, slots or holes. "DE-HINGE" features scale appearance, minimum gap and allows control surface removal without tools, pins or problems. Just remove the pushrod clevis, rotate the control surface 90 degrees and remove.

| "DE-HINGE" | BALSA FILLER BLOCK STOCK |
|--------------------------|--------------------------|
| 6 1/4" HINGES.....\$3.35 | 1/4" X 36".....\$1.10 |
| 6 3/8" HINGES.....\$4.45 | 3/8" X 36".....\$1.45 |
| 6 1/2" HINGES.....\$4.95 | 1/2" X 36".....\$1.75 |

If Not Available, Write Direct. Add \$2.00 (\$4.00 Outside U.S.)

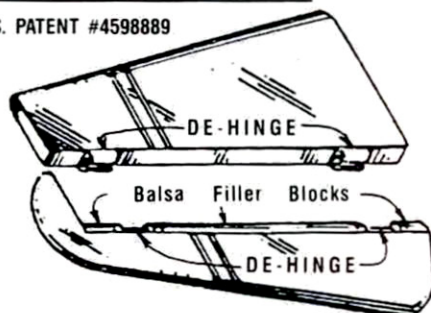
MODEL PRODUCTS CORP.

P.O. BOX 100, ALLAMUCHY, N.J. 07820

(908) 850-1508

10/91

U.S. PATENT #4598889



AGILITY WITH .60-SIZE STABILITY

by JOHN BONA

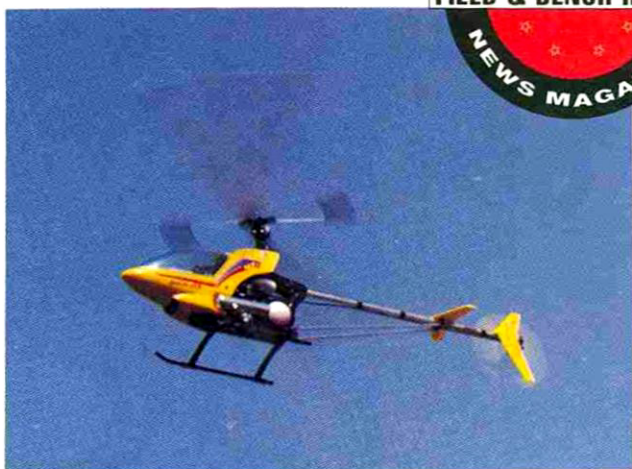
THERE ARE MANY good R/C helicopter kits on the market today. This, combined with a growing number of experienced pilots who can offer advice and assistance, makes it much easier for newcomers to get into this interesting and challenging hobby with much less aggravation and repair expense than it was a year ago.

Kalt—a Japanese-based company that's credited with being one of the first to manufacture R/C helicopters in kit form—has been around for a number of years and, in a very competitive market, it continues to improve; its kits are known for their excellent quality and workmanship. The Baron Alpha II—one of Kalt's newest kits—is distributed in the U.S. by Horizon Hobby Dist.*.

The Baron is a .60-size machine with a large rotor disk (62.5 inches), an extra-long tail boom, top-cone starting that replaces the belt method, a live tail-rotor drive system, an all-metal, assembled rotor head, a high-speed tail-rotor gearbox, carbon-reinforced plastic upper and lower servo trays and many other features that are "standard equipment."

The Alpha is carefully packaged in a colorful box that displays a picture of the completed helicopter on the top and sides. When you open the box, you'll see a blister-packed tray that contains all the large components. Under this, you'll find the canopy, the rear stabilizers, the tail boom and the rotor head. The nine small part bags are numbered to correspond to each assembly step.

The 25-page instruction manual is very thorough and easy to understand. (A separate manual is provided for the rotor head.) A four-page supplement to the instruction manual includes illustrations and instructions for the recent changes made to the kit. The excellent, colorful decal sheet has a placement diagram on the back.



PHOTOS BY JOHN BONA

KALT Baron Alpha II

SPECIFICATIONS

Length: 54.75 inches

Weight: 10 pounds

Gear ratio: 9.78:1

Engine: O.S. 61 SFN

Radio: JR Galaxy 8 PCM

Servos: 5 JR 4001 servos

Gyro: JR NEJ 120BB

Price: \$999.95

Features: assembled, all-metal rotor head; 2.5mm ribbed side frames; driven tail-rotor system; large well-positioned fuel tank; top cone start; pre-formed servo trays; ball bearings throughout.



As always, read the manual a few times to familiarize yourself with the parts and procedures before beginning assembly.

ASSEMBLY

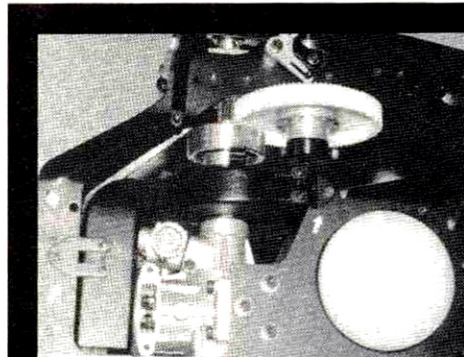
I won't bore you with a blow-by-blow account of the Alpha II's assembly; that's what the instructions are for. I'll just touch on a few things that might help you with the building process. First, assemble the side frames and various cross members. Always build on a flat surface so the frames will be at 90-degree angles to the building surface and, later, to the landing gear.

Next, assemble the clutch bell and the pinion gear; refer to the supplement instruction manual for the cone starting-system assembly. Install the assembly between the side frames using four M3x8mm bolts. Don't tighten the bolts.

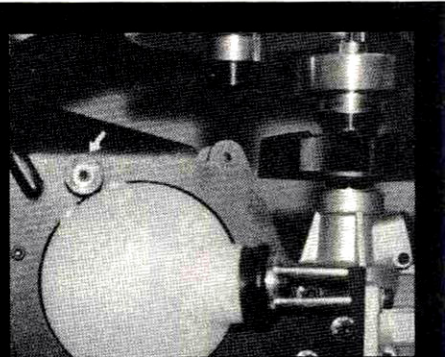
The Baron Alpha II doesn't have sliding-swashplate pitch control. It has a slide ring and a pitch rod that slides in a groove in the main shaft and through a pitch-control ring on the upper part of the mast. The pitch rod, which has 90-degree bends in it, connects the two. At this point, make sure that the slide ring is inserted between the side frames. A word of caution: the slide-ring control arms have a shouldered side and a flush side at the bearing end; the shouldered side must be assembled inward toward the slide-ring assembly.

ENGINE

I use an O.S.* 61 SFN engine for power. The kit comes with three tapered nuts for fan alignment—one each for O.S., Enya and YS engines. Remove the rear prop washer, slide the collar on, install the fan and a tapered nut, and tighten it securely. The clutch shoes are bolted to the fan's center hub. Be sure that you use the proper retaining bolts; they're different with the cone starting system. The starting shaft doesn't need



The shroud standoffs hold the shroud very firmly in place. No interference between the fan and shroud was experienced during flight.



The tank is prevented from rotating by an additional spacer and screw that are placed between two tabs that protrude from the tank's surface.

to be aligned at this point because it isn't bolted directly to the fan's hub. The clutch-shoe bolts protrude into the hub, and the grooves in the starting-shaft assembly slide onto the bolts. It's a close fit between the i.d. of the fan hub and the o.d. of the starting shaft. This is a nice setup that really cuts down on assembly time. When the fan and the clutch shoes have been installed, bolt the engine to the mount and install it between the side frames using six M4x12mm screws. Don't tighten the screws yet.

Next, build the main shaft components and main gear assembly. Assemble the pitch-control ring and rod first, then slide it into the groove on the main shaft—make sure that the pitch rod moves smoothly in the groove. I had to true-up on the 90-degree bend just slightly to achieve this, and I also lubed the groove with a light coat of grease.

With everything in place, pull up on the main shaft as you push down on the scissor-arm assembly, and tighten the scissor arm to the main shaft; be sure that it's at a 90-degree angle to the pitch-rod groove.

The fan shroud is installed next, and no

modifications are necessary. It fits perfectly on the engine's front housing. This means no air leaks, so there will be maximum cooling efficiency. If you use an O.S. engine, the kit provides a carb barrel stop screw to replace the original, which is too long and interferes with the shroud. If you use an Enya, use Kalt's barrel extension (included) to extend the carb-linkage hookup past the shroud. The shroud standoffs hold it in place very securely, and there's no interference between the fan and the shroud.

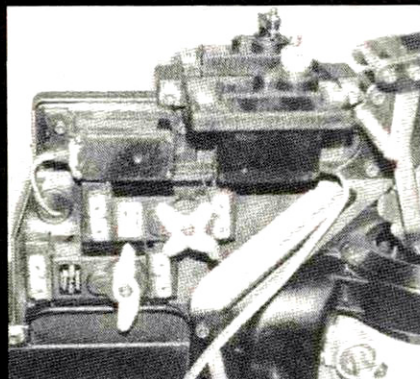
TAIL ROTOR

The tail-rotor gearbox comes fully assembled and requires only the installation of the blade holders and the bearings. Dual ball bearings, a smooth, precise pitch-control system and light nylon tail-rotor blades provide a durable, responsive, slop-free tail rotor. This is a very nice setup. The rear of the gearbox has a large access plug that can easily be removed for periodic lubrication. Be sure to remove the plug and apply proper lubrication before you install the gearbox.

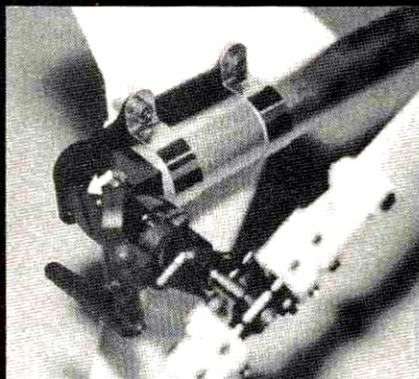
Three equally spaced drive-wire guides provide good support for the drive wire in the tail boom. Because the drive wire has one oblong end, you have to install it from the front of the boom and secure it to the gearbox with M4x4mm set screws. Trial-fit the boom and gearbox assembly between the side frame to be sure that the drive wire isn't too long; mine didn't require cutting. If you're happy with it, install the stabilizers and boom supports.

SERVO AND LINKAGE INSTALLATION

Most builders dread radio installation, but this kit changes all that. The servo trays require no building, gluing or painting, and they accept servos of all the most popular sizes. I use JR* 4001s. The servos are held in place with individual taped retaining plates and 2.6mm socket-head screws. The upper servo tray holds the two cyclic servos; it's bolted to the lower tray, which contains the other three. The complete assembly



The upper servo tray holds the two cyclic servos. It's bolted to the lower tray, which contains the other three servos. The completed assembly is then bolted to the lower support and main frames



The rear of the rotor gear box has a large access plug that's easy to remove for periodic lubrication.

BARON ALPHA II

is bolted to the lower support and main frames.

Install the control linkages as illustrated. This is the only area in which the instructions are a little vague, but it doesn't pose a problem. (The assembled rod dimensions aren't given.) Be sure that all servos are in the neutral position and all cyclic control are straight and level. Modify the servo wheel as illustrated, and install the rods. I came up with the following center-to-center ball-link dimensions:

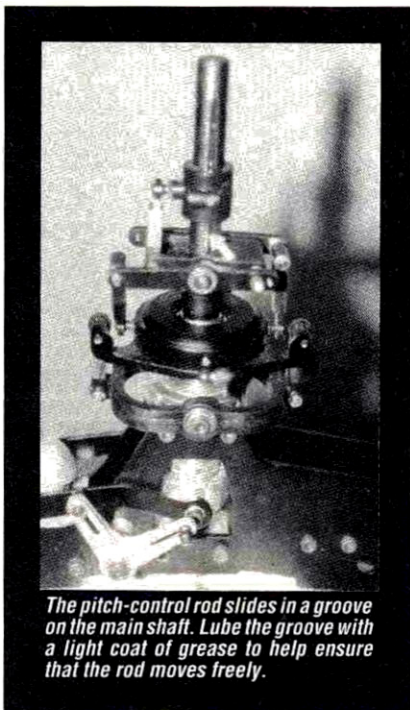
- servo to roll bellcrank—95mm
- bellcrank to swash-plate—72mm
- servo to fore/aft control arm—118mm
- servo to pitch-control arm—92mm
- throttle servo to carb—105mm

The "Black 10" rotor head supplied with this kit comes in two versions—the 10FS and the 10SII. The "FS" is "flapping and seesaw"; the "S" is just "seesaw." The assembled, all-metal 10SII that came with my kit is beautifully machined. The unique feature of this head is that the Bell/Hiller ratios and damping rates can be changed to adapt to flying abilities from novice to expert.

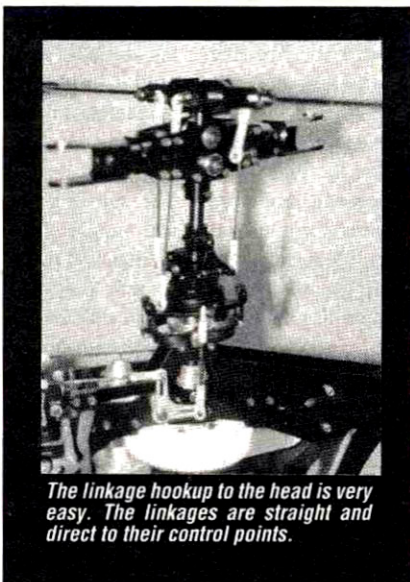
The head only requires final assembly. Simply install the flybar and the control arm, screw on the paddles and balance the flybar assembly. One note of caution: the collars that secure the flybar have a shouldered side; be sure that you install the shouldered side toward the bearings.

Before you install the head on the machine, it's good to balance the head assembly. I use a Robart* High Point Balancer for this, and it works quite well.

The blades supplied are of excellent quality. They're composed of laminations of hard and soft wood. The heavier, denser woods are at the leading edge. Each blade weighed 142 grams. The blade holders accept ends up to 18mm



The pitch-control rod slides in a groove on the main shaft. Lube the groove with a light coat of grease to help ensure that the rod moves freely.



The linkage hookup to the head is very easy. The linkages are straight and direct to their control points.

thick; the stock blades are 12mm. Plastic blade grips are provided to take up the extra space.

Hooking up the 10SII head is very easy. The linkages are straight and direct to their control points. Dimensions for head linkages are given. The only modification is in the ball links from the pitch arms to the blade holders. Each link (four in all) should be shortened 4mm to allow an approximately 1mm gap between the link ends; you'll need it later for tracking adjustments. When all the linkages had been installed, I installed the main blades and proceeded to set the initial blade pitches. Always set the half-stick specification first, then using the radio circuitry the high and low settings can be easily attained. At half stick, I set the pitch at +5 degrees, the low setting at -2.5 degrees and the high stick at +7.5 degrees.

FINAL ASSEMBLY

The canopy comes in two parts. No cutting or trimming is neces-

sary. A small container of bonding material is provided. The blue-tinted windshield is attached in three places by self-tapping screws. Painting isn't necessary. The canopy and rear stabilizers are white, but I wanted them to be a different color, so I gave three pieces to my buddies in our body shop, and they came up with this very pretty shade of pearl yellow. I applied the decals, and then it went back for a clear coat. It looks great and stands out well in flight.

After I reinstalled the rear stabs and the canopy (which is bolted to main-frame standoffs at four points), I checked the CG. With all the equipment installed as described, the CG was right on the money. This completed the assembly of the Kalt Alpha II.

FLYING

At the field, I gave the Alpha II a thorough pre-flight check, installed the blades and filled the tank. With the Ni-starter attached and throttle trim at half, the O.S. started right up.

One minor detail to note here is that the use of a long starter extension is a must. I used the X-Cell extension from Miniature Aircraft*. It worked well, but an even longer one would work better.

To let everything "settle in," I ran the engine and the machine for a while on the ground. This also gave me the chance to give the machine a good visual inspection.

Once I was satisfied, I slowly advanced the throttle. The Alpha II became light on its skids just under half stick. With a little more throttle, the Alpha II lifted off very smoothly. I brought it to eye level to check the tracking—perfect, no adjustment necessary. Minor cyclic and tail-rotor trim was all that was needed to maintain a truly stable hover. With the engine running on the rich side, I continued to hover the machine through a tankful of fuel.

When it was back on the ground, I checked it again. I repeated this procedure for five tanks, just hovering and performing low-altitude circuits. You become very comfortable with this machine in a very short time.

After I became familiar with the machine and gained confidence, I decided to fly through some aerobatics. The only maneuver I was skeptical of was an autorotation. The stock blades weren't weighted, and without the extra weight at the tips, the rotor system loses a lot of energy fast. I called the folks at Hobby Dynamics and requested a set of weighted blades.

In the interim, I flew the Alpha through a series of maneuvers, such as loops, which are large and round, axial rolls, split S's and 540 stall turns, all of which can be conducted repeatedly without any bad habits. You may notice that when the machine is in the inverted position, it requires a little more negative to maintain level flight because of the semisymmetrical blades and the coning angle of the head, but this can be remedied very easily depending on the kind of flying you wish to do.

A few days later, I received the blades I had requested—again, products of excellent quality. They came completely finished and covered, ready to be bolted on. Each weighed 187 grams.

With these blades, the heli seemed even more stable. The added weight slightly improved its flying characteristics without changing the Alpha's personality. Autorotations are very easy to perform with plenty of energy left over at the bottom. The live tail-rotor system, though basic in construction, works well.

(Continued on page 131)

PROGRAMMING

(Continued from page 88)

move the sub trims more than a few degrees. When you use this function, remember to use the mechanical linkages on your aircraft for any substantial changes and the electronic trim only for fine tuning the trims.

• **T. ADJ (TRAVEL ADJUST)**—Fun-fly aircraft are famous for using this function to "tame" or "turn loose" a hot design. To achieve maximum servo efficiency, the aileron and elevator servos are usually set to the maximum available throw, which in the X-347's case is 150 percent. For a full explanation, read my October '92 column entitled "Servo Output Tricks."

• **MIX E-F (ELEVATOR/FLAP MIXING)**—The elevator/flap mixing should be functioning while the spoilers are in use, which won't be possible with the default elevator/flap function. The latter would force you to toggle back and forth between flap-mode and landing-mode switch positions. To avoid this problem on the X-347, use the Programmable Mixing Function to create elevator/flap mixing (discussed next month). Using spoilers and elevator/flap mixing at the same time is what gives you the pinpoint accuracy for spot landings. On the other hand, if you want the ability to turn the elevator/flap function on and off at will in order to experiment with its effect on flight performance, then I recommend using this function instead of the flexible mixing.

CONCLUSION

Next month I'll continue with a discussion of landing functions, aileron differential, details of elevator/flap coupling, use of the flap-value adjustment knob and other interesting features that pertain to fun-fly mixing. If you take it one step at a time, I'm sure you'll find the discussion easy to understand and your X-347 easy to master. Keep those questions coming (in care of *Model Airplane News*), and I'll see you next month.

*Here's the address of the company mentioned in this article:

JR Remote Control; distributed by Hobby Dynamics, a division of Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821. For more information, contact JR Service America, (217) 355-9511. ■

FIBERGLASS

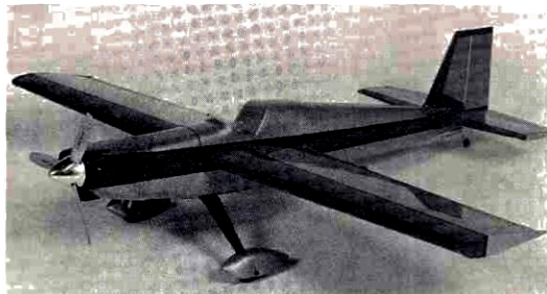
(Continued from page 70)

tom of the mold, and use them as handles to pull the fiberglass away from the mold.

If you still can't get the part off, drill a small hole through the top of the part and the mold. Insert a piece of 1/32-inch wire between the fiberglass and the mold to break the seal in this area. Sometimes the airtight seal will be what's preventing the part from coming off the mold. (Continued on page 130)

Put Some Pizazz In Your Flying!

with Lanier RC'S TR-260



A Great Aerobatic Performer

Fuselage Length: 44"
Flying Weight: 6 - 7 1/4 lbs.
Rec. Engine Size: .45 - .60
or .60 - .91 4 Stroke

Wing Span: 60"
Area: 620 sq. in.
Radio Channels: 4

Send a S.A.S.E. for your FREE Color Catalog.

P.O. Box 458
Oakwood, GA 30566

Phone: 404-532-6401
FAX: 404-532-2163



THEY ARE THE BEST.

The design and manufacture of all Technopower II fine scale radial engines is a blend of old world craftsmanship and high technology. This combination produces engines that are powerful, reliable and quiet. You deserve the very best, and that means a fine scale radial engine from Technopower II.

9 Cylinder "C" Series
73 Ounces • 4.0 Cubic Inches • 9" Diameter

TECHNOPOWER II INC.

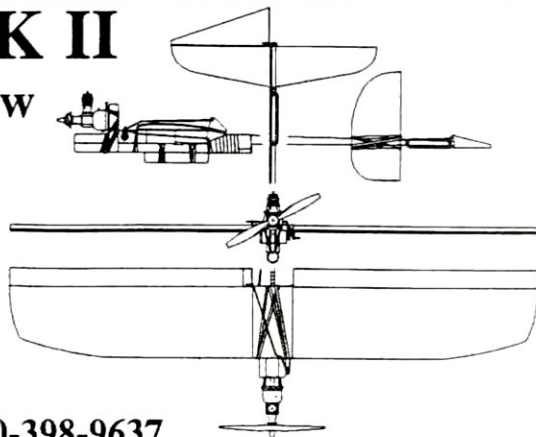
610 North Street, Chagrin Falls, OH 44022 • Telephone (216) 564-9787
Complete Brochure \$3.00 • Visa & MC Accepted

©1991 TECHNOPOWER II INC.

SIDEKICK II

Slope/.049 Glow

SPAN: 30-36 inches
AREA: 150-180sq.in
WEIGHT: 9-13 ounces
w/ STANDARD RADIO
CONST: Pre-Shaped,
Solid Balsa & Spruce
with 90-Day Guarantee
SALE: \$25 & \$4.00 S&H



POCKET R.C. 800-398-9637

ROTARY-WING ROUNDUP

NEW HELI PRODUCTS

Descriptions of new products appearing on this page were derived from press releases supplied by the manufacturers and/or their advertising agencies. The information given here does not constitute an endorsement by **Model Airplane News**, nor guarantee product performance or safety.



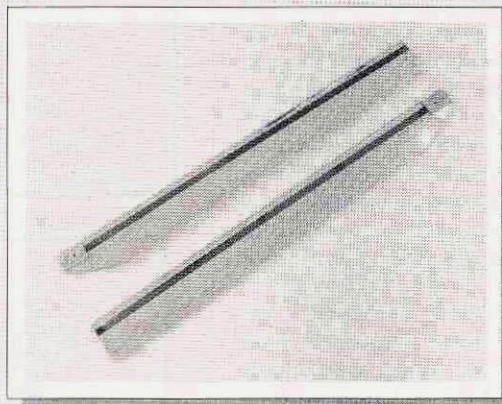
MINIATURE AIRCRAFT USA **Aluminum Elevator** **Swing-Arm Kit**

Use this kit to improve swashplate support and tighten elevator-control bellcrank commands, and to eliminate the possibility of high-speed flexing.

Part no. 0553

Price: \$34.95

Miniature Aircraft USA, 2324 North Orange Blossom Tr., Orlando, FL 32804; (407) 422-1531.



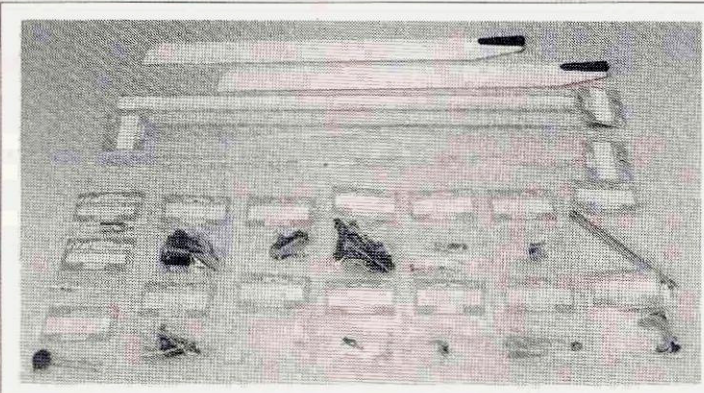
HOBBY DYNAMICS **Whisper Washout Rotor Blades**

KSJ's new, weighted, performance rotor blades for the Kalt Whisper electric helicopter have 3 degrees of washout. Because of their high efficiency rating, these blades will perform better for you in forward flight and autorotations. They may also be used with the Concept EP.

Part no. KSJ104

Price \$54.95

Hobby Dynamics Distributors; a division of Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-0022.



GREAT PLANES **SR Conversion Kit**

Turn your SE or SX into the latest version of the Concept 30 SR. This kit includes everything you need, except the landing gear and canopy. Among the 19 items included are Kyosho SR main rotor blades, a longer tail boom, special SR mixing arms, a 2mm tail drive and a rotor head.

Part no. KYOE6285

Price: \$259.95

Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826; (217) 398-6300.

CENTER ON LIFT

MICHAEL LACHOWSKI



HAND-LAUNCH GOLF

HAVE YOU EVER looked at a golf course and thought that it would make a nice flying field? This month, I'll tell you about Hand-Launch Golf, which turns golf courses into flying fields. Then, I'll discuss building an inexpensive, transportable sail-plane stand, and report on a new, carbon-fiber fabric that may be the lightest you've seen.



Joe Wurts completes a drive onto the fairway.

HAND-LAUNCH GOLF

I'm sure many of you think HLG means Hand-Launch Glider, but in reality, it means Hand-Launch Golf. On July 21, 1992, the League of Silent Flight (LSF) held the first national HLG tournament at the Fox Ridge Country Club in Vincennes, IN, and it was a terrific event.

As you might suspect, Joe Wurts was the winner with 28 strokes for 9 holes, Brian Agnew placed second with 29 and Paul Carlson was third with 30. They all flew with Michael Selig who was the fourth member of the foursome. Gil Gauger coordinated the event, but even



Contest organizer, Gil Gauger (third from right) and other fliers get ready to go onto the course.

with the club pro driving his cart, he didn't place.

To run the event, you need a golf course, some glider clubs and golf carts (or, should I say glider carts?). The rules are simple: launch the glider and follow it to the green. On the fairway, you must launch from behind the point where the glider lands. If your glider lands in a sand trap, you must launch standing still, with your feet together. We won't discuss water hazards!

On the green, the "hole" is a hula hoop. A glider is "in the hole" if any part of it touches the hoop. One flag stick away is one stroke. If the glider is any farther away, you may take two strokes or throw it to get it into the hole.

At the start of the Vincennes tournament, everyone chased their gliders on foot. A few holes later though, players used golf carts—more like hand-launch cross-country. There were a few notable throws, like Paul Carlson's hole-in-one on a par four, where

the model slid up to a hole that he didn't even see. A good throw could reach nearly any hole where the green was lower than the tee. Uphill holes required two throws.

Techniques off the tee ranged from throwing and heading out immediately to circling the tee at the start, getting into the



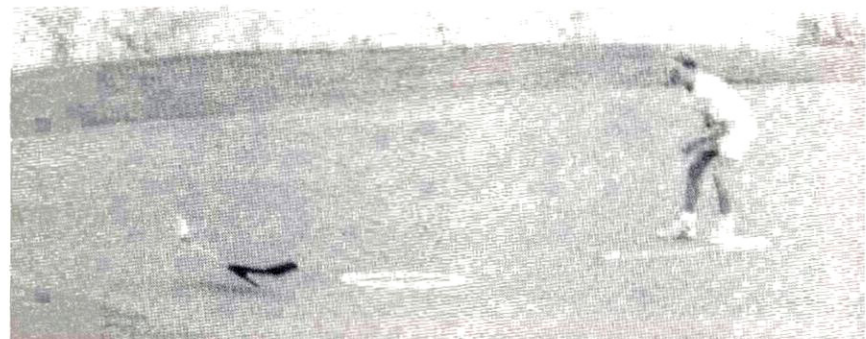
Even in HLG, traps are a hazard!

cart and arriving at the green the same time as the glider. All but the most athletic fliers needed a cart to follow their gliders.

If you're wondering how gliders affect the greens, don't worry. All gliders must have smooth undersides, with no teeth or other protrusions. The worst you can do is "dork" the glider; it results in a mark about the same size as a good golf approach shot. Smooth landings cause no damage and allow gliders to slide a long way, especially when the green is wet.

Expect to see HLG at next year's LSF Nationals, again in Vincennes. I wonder if anyone will come armed with a collection of gliders: a driving glider for long dis-

(Continued on page 102)



Wurts completes his drive onto the green. Notice the hula-hoop hole.

2 METER

WINDSURFER



Sheeted and cap strip wings, flat bottom with wash out. Plug-in wings for easy transportation. Plug-in and flying stab, canopy, are just a few of the features of the windsurfer.

Wing Span: 78 1/2 in. Length: 42 1/2 in.
Wing Area: 544 sq. in. Airfoil: Flat Bottom Highlift

WINDSURFER 100

Wing Span: 98 1/2 in. Length: 45 in.
Wing Area: 790 sq. in. Airfoil: Modified 205

EZ-1 GLIDERS



Wing Span: 78 1/4 in. Est. Flying Wt.: 26 ounces
Wing Area: 544 sq. in. Airfoil: Modified 205

EZ-2 "100"

A larger version of the EZ-1, easy building with turbulator spars, an open class glider that can perform with the best of them. Plug-in wings for easy transportation. Stress for high starts.

Wing Span: 98 1/2 in. Est. Flying Wt.: 45 ounces
Wing Area: 790 sq. in. Airfoil: Modified 205

TERCEL GRENADE-LAUNCHED



Wing Span: 50 1/2 in. Flying Weight: 11 1/2 ounces
Wing Area: 275 sq. in. Airfoil: Modified 205
Length: 31 1/4 in.



FLIPPER

Wing Span: 50 1/4 in. Est. Flying Wt.: 11 1/2 ounces
Wing Area: 270 sq. in. Airfoil: Modified 205

KASTAWAY



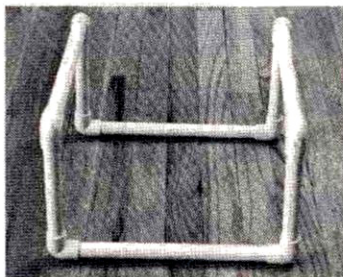
Wing Span: 59 inches
Wing Area: 380 square inches
Est. Flying Weight: 15 ounces
Airfoil: Modified 205



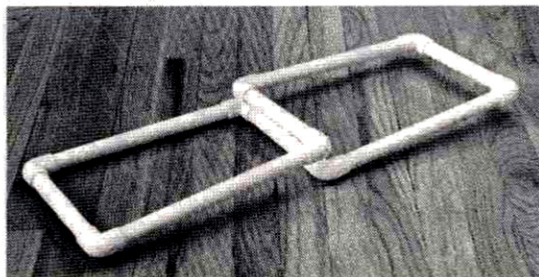
BRIDI AIRCRAFT DESIGNS, INC
23625 Pineforest Lane
Harbor City, California 90710

(213) 326-5013 549-8264

CENTER ON LIFT



Left: a simple, inexpensive stand can protect your sailplane. The wings sit on the horizontal tubes. Right: to allow the stand to be folded, the vertical joints on the elbows at the bottom shouldn't be glued.



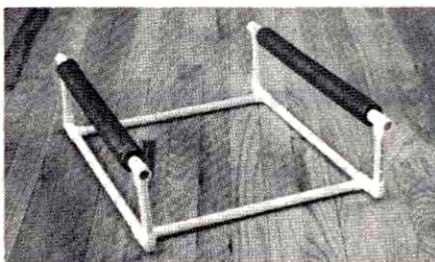
tances and chip-shot gliders for good handling around the greens?

ECONO SAILPLANE STAND

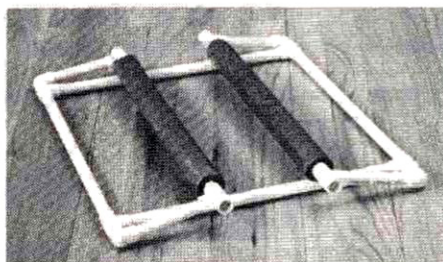
In the air, sailplanes are most efficient when they're clean. Between flights, they sit on the ground and can pick up a variety of things dirt, dew and even "copilots" like ants who

tubes. Don't glue one end of each vertical tube, so that you can pull the stand almost flat, as shown.

The other stand that I use is a little more complex. It has a flat bottom with two fold-down supports. This stand requires four "T" fittings for the bottom, four "T" fittings for the top and four 90-degree elbows that plug



Left: here's a slightly more complex stand which uses "T" fittings. Note the pipe insulation, which provides a softer surface on which to rest the model. Right: you can partially rotate the supports to adjust the height of the stand, or you can fold them down for traveling or storage.



want a free ride! Cleaning the sailplane after a landing is bad enough. Why do it before each flight, too?

To keep my sailplanes clean, I use a stand to support them. I'm sure you've seen plenty of stands, some of which are quite elaborate. When building a stand, many people forget that it must be transported, so it should be foldable to reduce the space it requires.

The simplest stand supports a plane by its wing panels. The major disadvantage of this method is that you must be careful with the flaps. Be sure you don't turn your radio on and drop the flaps, because they'll try to lift the sailplane.

To build an inexpensive stand, you need 6 feet of 3/4-inch PVC pipe and eight, 90-degree elbows. Cut the pipe lengths to the height and width of the panels desired. For example, cut 12-inch pieces for the horizontal tubes and 4-inch pieces for the vertical

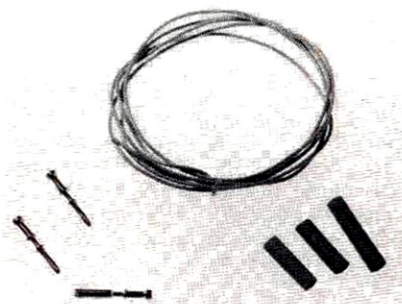
into the bottom "T" fittings on one side and slip over the tube on the other. To adjust the stand's height, rotate the support rails. Finally, install some pipe insulation on which to rest the model.

UNIDIRECTIONAL CARBON FIBER

Composite Structures Technology* now offers the lightest unidirectional carbon-fiber fabric I've ever seen. It's expensive—\$5 per linear foot. It weighs 2.25 ounces per square yard and is only 0.002 inch thick; a cross-thread of spun carbon every 0.25 inch keeps the unidirectional fibers together. This very smooth fabric has no gaps and is only 8.25 inches wide, but because of its thinness, overlapping shouldn't be a problem.

*Here's the address of the company mentioned in this article:
Composite Structures Technology, P.O. Box 4615,
Lancaster, CA 93539.

PRODUCT NEWS

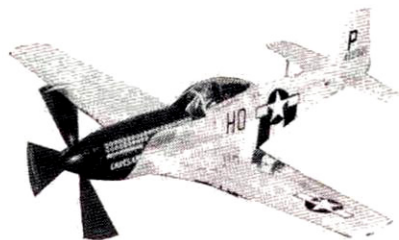


LAUREN ASSOCIATES Shove It Antenna Connector

These gold-plated connectors resist corrosion and provide a superior electrical connection. When the heat-shrinkable insulation is applied, the cantilever section of the female pin provides a snug, reliable fit. The connector works well in pattern, sport, racing and scale aircraft and gliders. Two male connectors (for two models), one female connector (for the receiver), antenna wire, shrink-tubing and instructions are included.

Price: \$2.79/kit

Lauren Associates, 630 Montview Pl., River Vale, NJ 07675; (201) 664-0803.

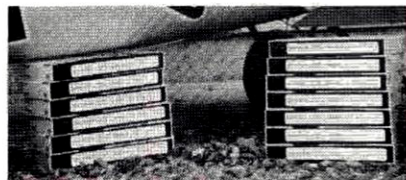


PICA ENTERPRISES INC. 1/5-Scale P-51D Mustang

This kit is built-up with balsa, plywood and hardwood construction; most parts are machined or die-cut. Recommended engines are 2-stroke, 1.5ci to 1.8ci. Specifications: wingspan—89 inches, wing area—1,356 square inches, fuselage length—77.5 inches, weight—17 to 20 pounds. The kit includes ABS cowl, oil-cooler, wing fairings with a PETG canopy, hardware, full-size printed plans, detailed instruction booklet and decals.

Price: \$319.95

Pica Enterprises Inc., 2657 NE 188th St., Miami, FL 33180; (305) 935-1436.



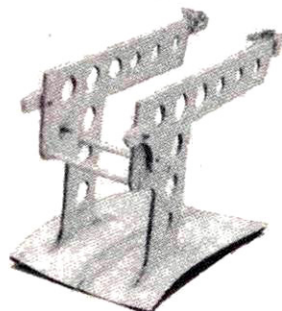
HANSEN SCALE AVIATION Five New Videos

Hansen announces the introduction of five, two-hour videos. (See ad elsewhere in this issue.)

- Vol. 15: 1992 FAI World-Scale Championships, AMA Invitational Scale Shoot-Out, NW Scale Masters.
- Vol. 16: Aerodrome '92, U.S. Naval Air Museum tour.
- Vol. 14: NW Seaplane Championships, Jumbo Scale Meet.
- Vol. 13: Top Gun Invitational Scale, 1992 Toledo Model Exposition.
- Vol. 17: 1992 U.S. Scale Masters Championships.

Price: \$19.95 (plus \$3 S&H)

Hansen Scale Aviation Video, 10807 SE Stacy Ct., Portland, OR 97266; (503) 653-2578.

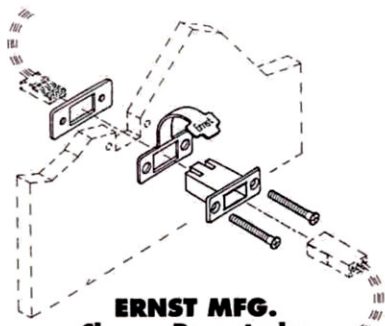


ROBERT THIBODEAU Glider-Release Platform Plans

Use these plans to build a self contained Glider Release Platform to launch your R/C glider from your existing R/C high-wing power plane. It's light and easy to build, and it allows you to launch your glider, fun fly, turn your plane into a bi-plane, and go back to fun flying all in one session. Instruction book and photographs are included.

Price: \$14.95 (plus \$1.50 S&H)

Robert Thibodeau, P.O. Box 323, Cheltenham, MD 20623; (301) 782-7244.



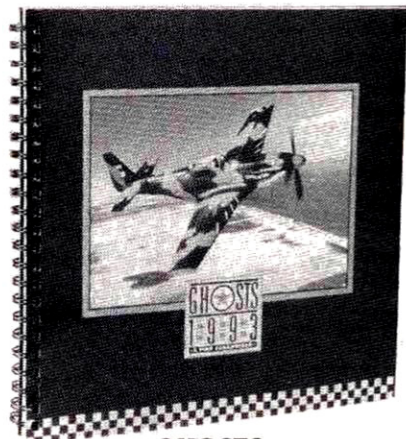
ERNST MFG. Charge Receptacles

Ernst introduces two charge receptacles for Airtronics, JR and Hitec radios. They allow instant access to onboard batteries for charging and monitoring, and each comes with a watertight, dirt-resistant rubber cover.

Part no. 152 (Airtronics); 147 (JR and Hitec).

Price: \$3.49

Ernst Mfg. Inc., 37396 Ruben Ln., Ste. B, Sandy, OR 97055; (503) 668-5597.



GHOSTS

1993 Engagement Calendar

This calendar is perfect for any aviation enthusiast's desk. After use, the calendar's date pages can easily be removed, and you'll have a collector's booklet of photographs that showcases WW II propeller-driven aircraft and the men and women who flew them.

Price: \$16.95 (plus \$3 S&H)

GHOSTS, 665 Arkansas St., San Francisco, CA 94107; (800) 331-8231; in CA—(800) 642-4554.

PRODUCT NEWS

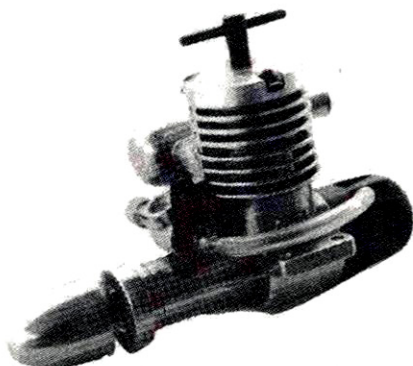


TELSTAR VIDEO PRODUCTIONS Top Gun '92

Telstar brings R/C enthusiasts multi-camera coverage of this prestigious scale event. This 116-minute video contains in-depth interviews and building tips from great pilots and builders, spectacular crash and slow-motion footage, detailed static footage, exciting narration and music, complete awards ceremony and more!

Price: \$29.95 (plus \$3.25 S&H)

Telstar Video Productions Inc., 114-3 S. Semoran Blvd., Winter Park, FL 32792; (800) 972-4847.



CARLSON ENGINE IMPORTS W/M Diesel Engines

Premier Engineering's AM diesels feature Schnuerle porting, side exhaust, larger crankshafts, mufflers, spinner nuts and detachable backplate fuel tanks. Suggested prop sizes for the .06 diesel are 6x6 to 7x5, and for the .09 diesel, 7x4 to 8x4. Both weigh 3.7 ounces. The engines start easily and offer excellent idling. They're pre-set and have a one-year guarantee.

Prices: \$55—.06; \$60—.09 (plus \$3 S&H).

Carlson Engine Imports, 814 East Marconi Ave., Phoenix, AZ 85022-3112; (602) 863-1684.



OHIO R/C MODELS Sukhoi SU-26mx

This giant-scale kit contains a balsa-and-plywood airframe and a scale, fiberglass cowl. The kit comes with a clear canopy, formed-aluminum gear and tail-wheel assembly. All parts are machined and sanded to ensure proper fit and alignment. Specifications: wingspan—84 inches; wing area—1,360 square inches; flying weight—17 to 19 pounds; engine—2.0 to 3.7, 2-stroke; 2.4 to 3.0, 4-stroke.

Part no. 130

Prices: \$349; built-up: \$795.

Ohio R/C Models, 4251 Lutheran Church Rd., Germantown, OH 45327; (513) 859-1660.



AEROSPACE COMPOSITE PRODUCTS Introduction to Vacu-Bagging Video

Aerospace offers an easy-to-understand, detailed video about proper vacu-bagging techniques. George Spitzer, an avid R/C pilot, builder and designer, gives suggestions and tips.

Price: \$25 (plus S&H)

Aerospace Composite Products, P.O. Box 16621, Irvine, CA 92714; (714) 250-1107.



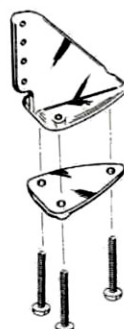
SAFE FLITE R/C PRODUCTS Switch Lock

Safe Flite offers a revolutionary way to lock your transmitter switch so that it can't be turned on and interfere with other equipment on the same frequency. It can also be used as a frequency board marker.

Part no. 100E

Price: \$4.99 (plus \$1.50 S&H)

Safe Flite R/C Products, 100 East 11000 South, Sandy, UT 84070; (801) 576-0942.



WING MFG. Control Horns

These streamlined horns have a three-screw mounting base. Self-threading screws give the horns a clean appearance and allow easy installation. The extra side areas prevents the horns from flexing under stress, and that makes them ideal for large models. They come with Phillips-head screws for non-slip assembly.

Part no. 195

Price: \$1.39/pair

Wing Mfg., 305 E. Simmons, Galesburg, IL 61401; (309) 342-3009.

Descriptions of products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News**, or guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News**.

SPORTY SCALE TECHNIQUES



FRANK TIANO

CUBS, MISSILES AND VIDEOTAPE

I'M VERY EXCITED this month because I'm able to report on a fabulous new gadget that promises to be one of the biggest boons to scale modelers since Dave Platt gave us the 80-inch concept and Bob Violette put the fan in ducted fans. By now,

Did you miss Top Gun? Well, the next best thing to being there is this video from Propwash Video Productions. Full of interviews, information and humor, it's one of the best I've seen.



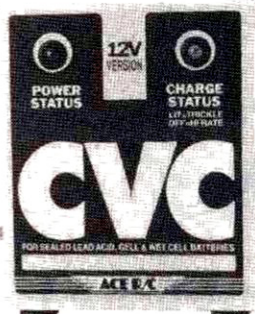
most of you have seen an advertisement about a flat, impressive-looking, lightweight power source that all but makes conventional Ni-Cd airborne flight batteries obsolete for large airplanes, especially ones that carry more than six servos, or battery-operated landing gear, or other electrical options. Well, I've been playing with these batteries for several months now, and I'm quite pleased to say that they've delivered all that the distributor has promised and then some.

MAT BATTERIES

I'm talking about the 6V receiver battery currently (can you think of a better place to put *that* word?) available from Model Aviation Technology* (MAT) right here in sunny Florida. For those who haven't seen the ad, this battery is a gell-cell so it doesn't have to play by the rules formed for Ni-Cd batteries. In other words, these batteries have an incurable case of amnesia—no memory build-up at all, and no reversing polarity problems. This flat, attractive unit weighs a mere 10 ounces and measures 3.75x2x1 inches. Since it's a gell-cell, it's simply vibration-proof and has much greater capacity than the batter-

ies we're accustomed to. Another bonus is that it's a 6V battery that works extra well with our flight packs that are used to working with 4.8 volts. Yes, have absolutely no fear, our systems accept 6 volts, and even 7 volts, very well. The end result is longer flight time and faster servo response, which I can't see anybody being upset with...well, except maybe for those guys who always crash on the first flight. But now, they can crash a little faster!

I've done some extensive testing on a couple of these units and have found them to produce in excess of 300 minutes of flight time under load! I charged one of them on May 15 and took a reading on September 15 and found the voltage drop to be from 6.7 volts down to 6.4 volts. I then spent two hours installing my new Airtronics radio in my old P-47, and after working the big flap and elevator servos a skillion times and getting all the throws set up to my liking, I did another voltage test and recorded an amazing 6.4 volts!



Ace R/C's CVC charger (6V version only # 34K308C) is the perfect match for the MAT battery. The constant-voltage charger features an automatic high/trickle operation. It won't overcharge your battery.

Now, not to confuse you, this battery isn't a lifesaver for those who sometimes forget to charge their batteries, but it sure has a built-in bonus when you figure that you can probably fly for several weeks between charges.

The best way to charge this \$30 marvel is to get yourself one of the Ace R/C CVC 6V chargers (either in kit form or com-

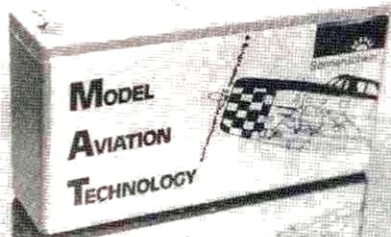
pletely built) that features an automatic high/trickle operation. In other words, you can't overcharge this little gray box. Model Aviation Technology has lots of these little gems in stock, and I'm certain you'll like them just as much as not only I, but several Masters and Top Gun pilots as well.

HONEST ENGINE

While I certainly don't have the expertise in solving engine problems that a Clarence Lee, Peter Chinn, Mike Billinton or Henry Nelson does, I sometimes get a little lucky simply because you don't live almost 50 years in this hobby without learning something! Anyway, I've received several letters concerning engines that simply quit after using only half of their fuel load.

A pressure fitting that's installed in a muffler in a location that allows the exhaust gas to pass directly over the opening does more to siphon than

it does to pressurize—something like the principle that many airbrushes and paint touch-up guns work on. When this happens, the muffler actually draws the fuel in the tank toward the muffler, and



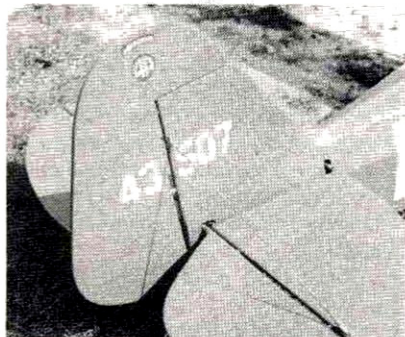
MAT's new 6V gell-cell receiver battery is just what large-scale modelers are looking for. It gives your servos more juice for a longer period of time.

no pressure enters the tank at all. This may not be a problem until you're at half-tank and that carburetor is sucking like mad for some fuel and your muffler is sucking like mad not to give it any! The result is called going *lean*, and it's usually followed by a complete stopping of the circular motion of that once-life-preserving thing we call a propeller! So if you experience this problem, try moving your pressure fitting to an area away from the very top or bottom of the muffler where siphoning may occur. Usually, a corner is a good spot.

SPORTY SCALE



A peek behind the pilot in Gerry Yarrish's Piper L-4B reveals a "dummy" RCA Army field radio complete with dials, tuning knobs and placards. The R/C flight pack is inside the dummy radio!



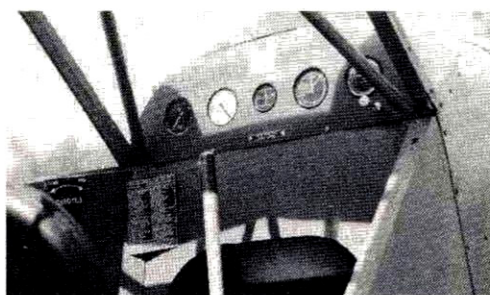
There are more than 120 rib stitches on the tail surfaces and 38 more on each rib in that 12-foot wing!

EAGLE ENTREES

I'm not going to spend a lot of time on this next item, but I'd just like to say that Eagle Miniatures* has just about any ordnance kit you could ever ask for as long as you're flying a *jet*. Eagle is a new company that offers simple kits on everything from ejection seats to smart bombs, from Phoenix missiles to Sidewinders and from weapons pylons to jamming pods—everything for jets and jets only. No, they don't make skatey-eight types of ordnance for WW Twice jobs; no, they don't make cutie little bombs for your Albatross; they make realistic-looking, very scale stuff for *jets*. Send them a buck, and ask them for their jet ordnance sheets. Tell them you read about it in *Model Airplane News*.

CUB IN FATIGUES

Gerry Yarrish is not some new East Indian appetizer but the name of an actual person in the employ of *Model Airplane News*. In fact, this dude is the Associate Editor, which means that he's the one who takes all the flak when Major Atwood fouls up. He's also Senior Editor of another Air Age publication—*R/C Boat Modeler*. This brings us to a great story this month. You



The cockpit is enhanced with miniature placards and a checklist that were produced on Gerry's Macintosh PC. The compass deviation card, the "rear seat for solo flying" placard and the throttle quadrant cover add a lot to the scale look.

see, Gerry, called "Yerry" for short, has had a long-time love affair with just one airplane. That's right, this guy who spends the greater part of the month knee-deep in water taking pictures of stuff that floats just loves Piper Cubs. So he got himself a Balsa USA* 1/3-scale Cub kit and started modifying it into a Piper L-4B Grasshopper (the military version).

His documentation was from a restored Cub actually used by the 82nd Airborne Division during WW II. I wanted you all to see Perry's Yub, I mean Gerry's Cub, so that it might provide an inspiration to some of you who drool at scale models but think you don't have the ability to make one. I mean, this one doesn't even have floats! I've always thought that a good modeler can make any kind of model he wants, and I think that Gerry has just proved me correct. Check out Gerry's "Field & Bench" report on the Cub in this issue.

VIDEO VALUE

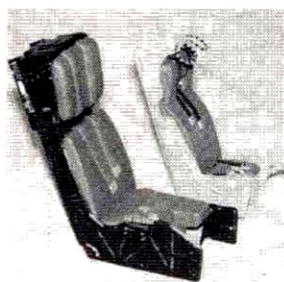
Since I'm being so generous this month, and so flattering, I might add, with all kinds of secret information and stuff, I thought I might throw in a plug for our old friend Werner "the Wolf" Kopp. Werner and his wife operate Propwash Video Productions*, and the reason I'm introducing them to you is that they've got the absolute best videotape on Top Gun I've seen to date. He has captured all the action and all the people. He has some great interviews, and the tape is very infor-

mative and sometimes quite humorous. The narrator is a chubby little Italian fellow with a gift for gab. Werner has tapes of the Masters Scale contest, too, as well as the '91 Top Gun for those who may have missed it. If you'd like to see your favorite modelers up close and personal, give the Wolf a call and try one of his tapes. Yes, he not only takes plastic, he loves it!

SOMEONE CARES!

A few issues back, I shared some information on how to make your O.S. 3500 run even better than you might hope for. Well, it wasn't only you guys who were reading that column; the guys from Hobbico* were reading it as well. As you probably know, Hobbico distributes the O.S. 3500 to its vast dealer network and constantly monitors the sales and performance of all its proprietary products. In this case, Bill Baxter gave me a call to recommend that, for even more power and even less tendency to run warm, you should replace the

fuel lines with the next-larger size, both in the tank and to the engine. In other words, replace the brass tube in the tank with the next size up, which I believe is the 5/32 size, and then replace your standard-size fuel tubing with something like Aerotrend's* large-size blue stuff. Evidently, the carb on this engine is so efficient, and the engine so powerful, that the larger volume of fuel is more than



The 1/10-scale FA-18 seat (left) and the 1/10-scale F-4 seat (right) are examples of the cockpit detail you can add to your jet with Eagle Miniatures' kits. A finished seat weighs less than 1 ounce!

welcome. The result is more rpm, cooler running and a much less critical needle valve. Thanks Bill; we needed that!

TRUE COLORS AREN'T FREE!

As a manufacturer, I can't tell you the value of having one of your products written up by *Model Airplane News*'s very own resident whacko, Chris Chianelli, in his popular "Air Scoop" pages. Unfortunately, His Whackiness sometimes gets



These are just some of the weapons and accessories available from Eagle Miniatures. Vacu-formed, and scored for easy cutting, the stuff is made of lightweight polystyrene and adds a lot to the looks of your model jet.

sidetracked by one of the several attractions at the publishing offices and makes a royal mistake that sometimes can become a royal pain in the eye for said manufacturer! Case in point: the True Colors that was written up a few issues ago is simply a book containing seven pages of genuine 1x2-inch color chips used during WW II. There are chips from the U.S. Navy and Air Force, Japanese Army and Navy, British R.A.F., German Luftwaffe, Italian Air Force and those of Russia, Rumania and Turkey. There are between nine and 12 chips per page. The most unfortunate thing I must report is that though these color chips are very accurate (signed off as being so, by Dave Platt, AMA scale board chairman) these color guides *aren't* free. We've received almost 100 letters to date asking for the free "True Colors" guide as mentioned in "Air Scoop"! Sorry, guys. If you need one of these books, they cost \$32 post-paid (check, money order, or Visa/MC) and are available directly from FTE*. Thanks for understanding.

So much for this issue, guys. Next time, we'll have lots more pictures of what our fellow scale modelers are working on. Until next time, don't forget that since the Wright Flyer had no fuselage it also had no CG, and that's why they needed those big long rails and a 100-foot bungee cord to get it airborne. Until later, dudes, your six is clear.

*Here are the addresses of the companies mentioned in this article:

Model Aviation Technology, 12848 Touchstone Pl., Palm Beach Gardens, FL 33418.

Eagle Miniatures, P.O. Box 468, Streamwood, IL 60107.

Balsa USA, P.O. Box 164, Marinette, IL 54143.

Propwash Video Productions, 2973 Berman St., Las Vegas, NV 89109.

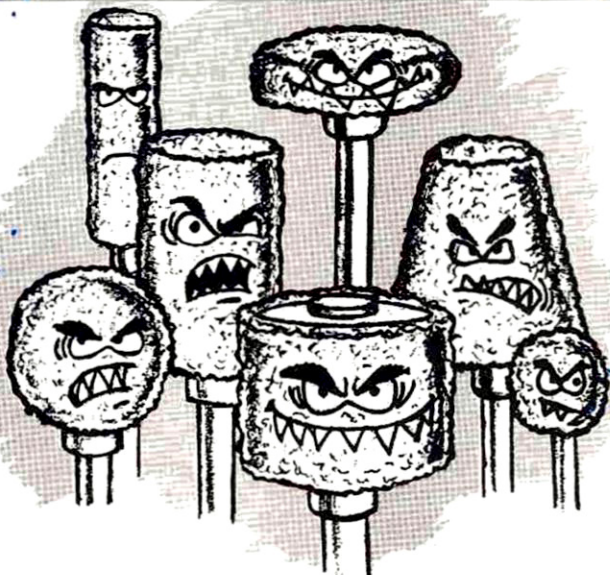
Hobbico/Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61824.

Aerotrend, 31 Nichols St., Ansonia, CT 06401.

FTE, 15300 Estancia Ln., W. Palm Beach, FL 33414.

A rough bunch of characters want to smooth out your next project.

robart **Ruff-N-Tuff** **CARBIDE CUTTERS**



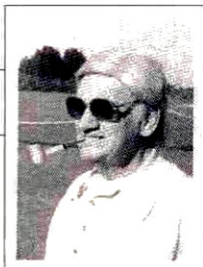
Robart Ruff-N-Tuff Carbide Cutters do all the nasty work for you quickly and with no complaints. Cut through, grind off, clear out, rough up, sand down, rip off, smooth out. These guys are carbide-quick and cool, and they never load up! Wood, fiberglass, lexan, plastic, ceramics, no modeling material scares them. They're quite an abrasive bunch, and are available in a variety of shapes and in two different grits. Robart Carbide Cutters are a rough bunch of characters all right, but you can be sure they'll never rub you the wrong way!

Reach for **robart**

At Hobby Dealers Nationwide

P.O. Box 1247 St. Charles, IL 60174 708-584-7616

GOLDEN AGE OF R/C



HAL DeBOLT

GALLOPING GHOSTS AND LARK

WE HAVE NOTED coincidences before and here's another. Would you believe that a few days' mail brought letters from both Bill Broadley and Nate Rambo, who were R/C buddies in the Pennsylvania/New Jersey area in the early '50s? Bill is still in West Chester, PA, but long ago, Nate migrated to Camarillo, CA. For those who are wondering, Nate has gone into the Experimental Aircraft Association movement.

"GALLOPING GHOST" STORIES

In the June '92 issue, using what information I had on hand, I discussed "Galloping Ghost" (GG), a method of obtaining two controls with a single-channel radio. In the early days, only single-channel radios were available and there was a great desire to have more controls and proportional action. GG was initially a mechanical method that attempted to satisfy these desires and, for some, it proved superior to just ("bang-bang") rudder only.

In that issue, we couldn't tell you who invented the GG concept, but now we know. Bill tells us that he contrived the birdcage-like contraption that integrated rudder and elevator using a pulsing motor actuator that also provided a form of propo action.

To understand what Bill tells us, you must realize that the receivers of that time were especially susceptible to any noise generated by the model. Metal-to-metal connections, such as pushrods to control horns, were positively a no-no. Anything



A photo from the first Tournament of Champions shows three of the LARKs who were responsible for inventing early digital radios. (They were also members of the Valley Flyers.) Left to right: Cliff Wierick, Maurice Woods, Phil Kraft and Doug Spreng.

that rattled could cause a disaster. Later, a "noise-trap" circuitry, which modern radios still have, eliminated the problem, but that improvement took time!

Bill says that he and Nate developed the wire linkages that were attached to the rudder and elevator that provided control as the actuator pulsed.

Nate described the system in the English *Aeromodeler* magazine. It was later widely publicized in our American magazines.

Bill says that the noise of the linkages rubbing together plagued

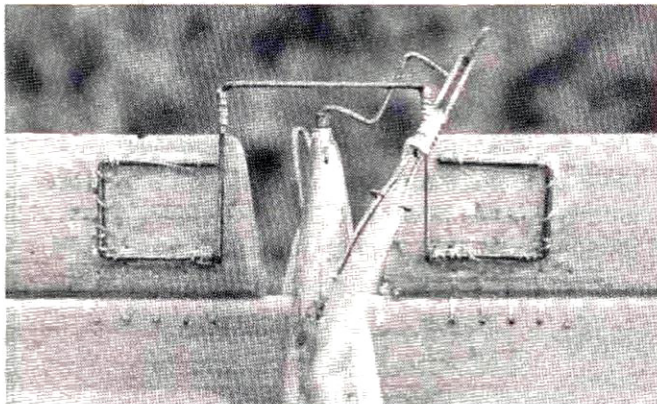
his invention. If only he had the plastic tubing that's available today! Too often, we take the little niceties we have now for granted!

Bill's invention was soon outdated by Don Brown's transmitter, which effectively mixed the signal and created similar results without the birdcage linkages. How he did this with only single-channel equipment is beyond my comprehension. Perhaps someone can enlighten me? We do know that Don had pulsed, proportional multi-systems that used more than one channel.

Bill intends to donate his original GG system to the AMA museum—a most worthy effort!

LARKS SONG OF SUCCESS

In the '50s, Nate became deeply involved with the Los Angeles area R/C movement and its prestigious clubs. As an active



Many people tried the Galloping Ghost. This is one man's version.

GOLDEN AGE OF R/C

R/Cer, he observed the early propo systems' developments, which pointed the way to today's equipment. Nate says: "While the Japanese produce most of today's R/C systems, it was just a few Los Angeles area modelers who pioneered the idea." I should add that American manufacturers first offered propo systems, but down the road, they allowed the Japanese to take the market.

The LARKs (Los Angeles Radio Kontrollers) was one of the nation's top R/C organizations at that time. Nate tells us that avid R/Cers thought nothing of driving 50 to 100 miles to attend club meetings. The reason? That was where the much-needed knowledge of electronics and model design could be found! Famous modelers like Dunham, Bonner, Pullen, Mathis and Spreng, who were on the leading edge of propo at the time, were at each meeting.

In his letter, Nate simply bypasses the reed era and goes into what was the beginning of our modern systems. He recalls that Pullen and Spreng were TM technicians at the renowned Pasadena Jet Propulsion Labs, and they applied their work-oriented knowledge to the needs of R/C.



Dean Kenny was an active LARK member. The transmitter looks like early F&M reeds. Note the LARK decal on the stabilizer.

With such a large and prestigious membership, an average R/Cer could easily be lost in the LARK's shuffle. Also, the LARKs dominated the flying at both of L.A.'s major fields. This congestion led the members to split and form other clubs. As propo systems became commercially available, the attraction to the LARKs dwindled, and so did their membership. In the mid-'60s, the Valley Flyers (VF) emerged as the elite club it is today, with a mixture of novice and advanced R/Cers.

VALLEY FLYERS TAKE OFF

Nate adds to our knowledge of early propo endeavors with the following: from '61 to '63, Jerry Pullen designed and built the first successful system. The reliability of this system was contest-proven by experts like Spreng, Wierick, Smith and Rambo.

Following that invention, Pullen teamed with Spreng to develop a digital system.

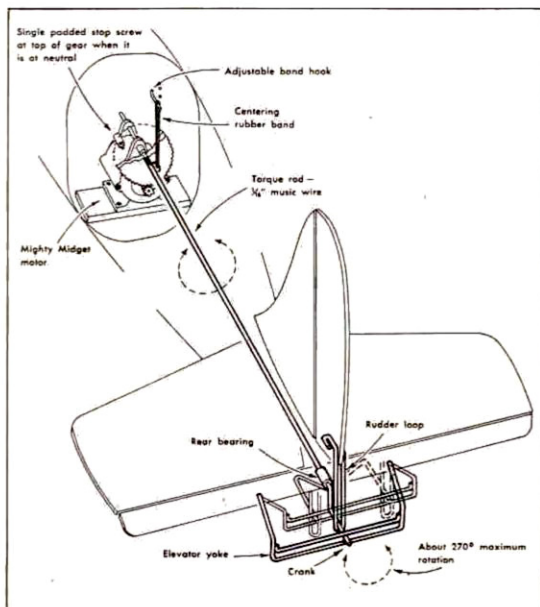
Spreng's advanced servo amplifier design is unsurpassed. Later, Pullen became Kraft's electronic specialist; the "P" in the Kraft KP Series honors his efforts.

Other Valley Flyers also got into the act. Howard Bonner's great effort is well-known and so are Orbit's and Kraft's. Dunham notes that propo was the death blow to reeds. Many ranking pattern fliers favored VF members Bill Salkowski and Jim Odino's custom-built "S&O" systems.

Another notable VF was, and still is, engine-genius Clarence Lee. In the early days, Clarence developed some of the finest R/C engines ever produced. His Lee .45 was a perfect jewel! Clarence went on to develop engines for the Veco Corp.

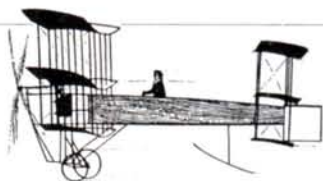
The VF pattern people were piling up considerable air time, so they were qualified to test Clarence's prototype engines. When some VF members got into pylon racing, it was Clarence's attention to their engines that led them to world records. Clarence became a K&B expert and continues a variety of engine work. He was a great help to me during my racing days—an especially wonderful guy!

I hope you enjoyed Bill and Nate's input to your OT R/C place! ■



This is Bill Bradley's Galloping Ghost invention, which provided two proportional controls with only one channel.

CLUB OF THE MONTH



The West Essex Aeromodelers

52 Broad Walk
South Woodford, London E18, UK

From the other side of the pond, Sid Sutherland, editor of its quarterly newsletter, sends news of The West Essex Aeromodelers club. It was founded in 1947 when several smaller groups east of London, England, combined. The groups were kept alive during WW II by junior members, since most senior members were serving in the RAF or the Fleet Air Arm.

During the war, no glow-powered engines could be flown in England, so modelers flew free-flight, rubber-powered models and gliders (if they could get rubber). Well-worn copies of *Model Airplane News* brought into the country by American forces colleagues kept modelers up-to-date on the latest innovations and provided news of the "forbidden engines," such as Olhson, Bunch and Denney Mites.

Today, the club has about 140 members and rents two, 30-acre, grass fields; each field costs roughly \$2,400 (U.S.) annually. Most members fly sport or scale models, and quite a few powered gliders use the locally popular A.E. 1.5cc diesel engine.

The club prides itself on its efforts to bring new and junior members into its organization. We'll help the West Essex Aeromodelers celebrate their 45th anniversary with two one-year subscriptions to *Model Airplane News*!

**The Famous Pasadena
IMS MODEL SHOW**
FLASH! IMS WILL HAVE THE ONLY
MODEL HOBBY TRADE SHOW IN
SOUTHERN CALIFORNIA FOR 1993!
It's a Selling Show!

PASADENA CENTER

300 East Green Street, Pasadena, California
JANUARY 8, 9, & 10, 1993

Friday: 2pm-7pm, Saturday: 10am-6pm, Sunday: 10am-5pm

Admission: \$6.00 • Children under 6 FREE when with adult

**Win an R/C System (1st) or
Trophies (2nd & 3rd) with your
Static Display Models!**

**FREE Model Airplane Building Lessons!
RADIO CONTROLLED CARS • BOATS
PLANES • HELICOPTERS • TRAINS**

FOR SHOW INFORMATION, PHONE 714-723-6057, or Fax 714-723-0913

SWAP SHOP - For Info, call Red: 209-931-0214

GIANT RAFFLE

Advance Admission Tickets Available

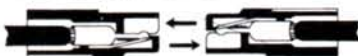
International Modeler Shows, Inc., Dept. A • Box 10127, Costa Mesa, CA 92627

"Say NO to Drugs, YES to Model Hobbies!"

PASADENA • ORLANDO

"High-Amp" Powerpole® Modular "Silver Plated" Connector

Rated 30 Amps at 600 V.D.C. Electrical Resistance 250 Microhms
Color Co-ordinated (Red & Black Lexan Housing)



Recognized
File No. E-26229

CSA Certified
File No. LR25114

Anderson
Power
Products, Inc.

Only certified checks or money orders accepted. Minimum order
\$14.00; for three packages of 4 Powerpoles (\$4.00 per package +
\$2.00 shipping and handling). CT residents add 8.5% sales tax.
Prices subject to change without notice.

DEALER INQUIRIES INVITED. For further information and
dealer prices send SASE and Business Card to:

**SERMOS™ R/C
SNAP CONNECTORS, INC.®**

Cedar Corners Station
Box 16787, Stamford, CT 06905

(203)322-6294

IMPORTED DIESEL ENGINES World's Best Selection

AE, Aurora, Cipolla, D-C, KMD,
MAP, Mikro, MK, MVVS, PAW,
Pfeffer, Silver Swallow, and USE.
Also Replica Mills, MOVO and
Letmo diesels and rare imported
glow engines and CO₂ motor
sets. Ten page catalog \$1.00.

CARLSON ENGINE IMPORTS

814 East Marconi, Phoenix, AZ 85022-3112

NAME THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If so, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.

Congratulations to R.E. Daly of Flushing, NY, for correctly identifying the mystery plane in the October '92 issue.



There were 23 correct entries. In the '50s, Lockheed's Missile Systems Division designed and built the X-7. It was used to develop powerful new engines for USAF ramjet missiles. It's powered by a Marquardt



ramjet. Several of the planes were tested and launched from a B-29. The X-7 used a recovery chute, and this made a number of tests possible and reduced test-program costs. ■

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to *Model Airplane News*. If already a subscriber, the winner will receive a free one-year extension of his subscription.

The Ultimate Mustang is now **All Composite !!**



Ready to Paint in

Hours Not Months

Still only \$800.00 delivered.

Racers!! 9 lb. Airframes

Worlds fastest Steletto is now available in

Carbon fiber / E-Glass

or

Carbon fiber / Kevlar

Sky aviation (514) 449-0142

ENGINES ALOFT

BOB GILBERT



O.S. MAX FP 40

STATIC THRUST testing has some value in the testing of model airplane engines. It may be useful to help you select an engine of the correct size for a given aircraft. It may be helpful in comparing the static thrust of two different brands of propellers. What static thrust testing can't do is make certain that you've selected the absolutely best propeller before you fly.

The only way to really get the maximum flight performance from your airplane is to experiment with the variables until you get the results you want. The variables include props, fuels and glow plugs, to name a few.

I've found one set of circumstances when the static thrust test is of real value, and that's when you're interested in sizing an engine/propeller combination to give that hot airplane of yours a vertical take-off, such as being launched vertically from the hand. The formula that I've found to work is to have 15 percent more static thrust than the total weight of the plane. Because the selected propeller may end up with a very low pitch, the highest speed attainable in level flight may be limited.

In the future, I may include thrust tests as part of engine reviews. Do you think that it would be worthwhile information? Write to me with your opinion.

O.S. 40 FP

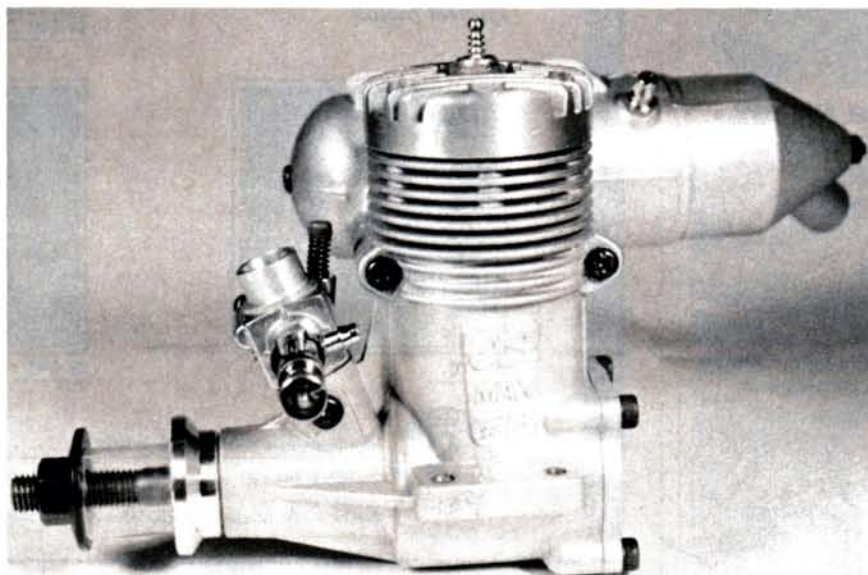
O.S.* has recently introduced the ABC-type construction in its 40 FP. I was anxious to see if it was as good as the older versions that I'm very familiar with.

An O.S. 35 FP that I purchased years ago was followed shortly by an O.S. 40 FP. The 40 has been my most used engine over the last four or five years. It's the only engine that I ever actually wore out, and that

was after many hundred—possibly over a thousand—flights. I've recommended the purchase of this engine to many beginners, and no one has told me that they didn't like it. On the contrary, some have thanked me for the advice! While it's far from being the most powerful 40 on the market, selection of an engine shouldn't be based on top-end output alone. It's horsepower (or torque) per pound that counts. Believe me, the O.S. 40 FP really shines in that department. Instead of putting a super-hot, super-expensive 25 in that next plane, use the 40 FP. You'll save a lot of money. FP engines don't have any ball bearings to get rusty.

The instructions that come with the new 40 FP describe it as an "ABC-type" construction. Does that mean that it's similar to ABC construction, but different? I really don't know, but it's a great-running engine, and that's what really counts.

On to the test bench it goes, and it gets a black Tornado 11x4 prop. I add a Fox RC Long glow plug and use Red Max* 5-percent-nitro fuel. On the first run, with the needle valve set $1/2$ turn rich (per instructions), I get 10,400rpm. Leaned out, it goes to 10,900. Very good! After two 4-ounce tanks of fuel, it runs so well that I mount it in my modified Miss Martha. The weight without fuel is 3 pounds, 11 ounces.



PHOTOS BY BOB GILBERT

The weather is decent, so let's go fly! It's 32 degrees Fahrenheit, the sun is bright and there's almost no wind. First flight is with the same Tornado 11x4 prop, but I went to Red Max 15-percent-nitro fuel. It starts easily by hand, even in the cold, and it idles at 2,400rpm. Its vibration levels are about average. This is an easy thing to visually

check in this airplane because the tank is exposed, and the fuel will bubble if there's much vibration. The Miss Martha flies really well with the FP 40: great vertical performance, good throttle response and a reliable idle that didn't quit once in the air during four consecutive flights.

Next I try a Graupner* 10.5x6 prop. Idle is the same, vertical performance is slightly faster, but it doesn't slow the airplane down as much at idle. I think I'll be using a 10.5x5 or 11x5 for competition fun-fly work.

I eventually snagged a rut while running along on the ground during a touch-and-go, and wiped the landing gear right off. That put an end to the flight tests.

A few days later, I ran some additional bench tests. The temperature is 40 degrees Fahrenheit and the test stand is located over gravel. I filled the tank with 15-percent-nitro Byron* sport fuel. The results follow:

| Propeller | Max rpm | Max dB |
|-----------------|---------|--------|
| Zinger* 10x6 | 10,600 | 92 |
| Graupner 10.5x6 | 11,000 | 92 |
| APC* 10x7 | 10,800 | 92 |
| APC 10x9 | 9,300 | 91 |
| Graupner 11x7 | 9,300 | 91 |
| APC 11x7 | 10,100 | 91 |

If these dB figures are too high for you, O.S. offers a "mute." It consists of a tubular muffler extension, a baffle and a longer screw. It takes a minute to install and costs about \$15. This is a really effective muffler extension that will lower the sound level about 2 or 3 dB with little or no drop in rpm. Here are some comparative tests.

With mute installed:

| Propeller | Max rpm | Max dB |
|-----------------|---------|--------|
| Zinger 10x6 | 10,900 | 90 |
| APC 10x6 | 10,700 | 90 |
| Graupner 10.5x6 | 10,500 | 88 |
| APC 10x7 | 10,400 | 89 |
| Graupner 11x7 | 9,200 | 88 |

All O.S. FP series engines that I've owned have been easy to hand-start after a little break-in. Not all other owners agree. Just why some engines hand-start easily and others don't has always been a mystery to me.

The O.S. 40 FP and its smaller sister, the 25 FP, remain my two most used engines. The O.S. 40 FP has been advertised as being one of the most popular engines in the O.S. line. I believe it's one of the best buys on the market and a perfect engine for beginners.

**Here are the addresses of the companies mentioned in this article:*

O.S./Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826.

Red Max Fuel, distributed by FHS Supply, Box 9, 239 Bethel Church Rd., Clover, SC 29710.

Graupner, distributed by Hobby Lobby International, 5614 Franklin Pike Cr., Brentwood TN 37027.

Byron Originals, P.O. Box 279, Ida Grove, IA 51445.

Zinger, distributed by J&Z Products, 25029 S. Vermont Ave., Harbor City, CA 90710.

APC Props, P.O. Box 938, Knights Landing, CA 95645.

Still on the Chain Gang?



Get more power than "chainsaw" engines, with less weight—from SuperTigre Giant Scales.

Lower weight. Higher fuel economy. Less noise. More power. These are all advantages from powering your giant-scale models with glow engines developed specifically for R/C flight.

You'll get them only from SuperTigre.

Even if your model spans 12 feet and tips the scale at 25 pounds, SuperTigre glow power can bring it to life. Using revolutionary giant-scale technology, the 2.76 cubic inch G-4500 produces a massive 4.5 horsepower.

SuperTigre's 1.5 cubic inch S-2500 and 1.8 cubic inch S-3000 also combine raw muscle with great efficiency, while adding less than 3 pounds to your total flying weight. Schnuerle porting, ball bearing-supported crankshafts, aluminum pistons, steel cylinder sleeves and large cast heatsink heads supply the power needed to move mighty ships.

The S-2500 and S-3000 include radial mount, glow plug and 2-year warranty protection.

And in all three engines you'll find the innovative engineering that only SuperTigre brings to giant-scale power.

For a free brochure and location of the dealer nearest you, call 1-800-682-8948, ext. 0286.

2 Year Warranty



Distributed Exclusively Through
GREAT PLANES
GREAT PLANES MODEL DISTRIBUTORS COMPANY
P.O. BOX 9021, CHAMPAIGN, IL 61826-9021

© 1992, Hobbico, Inc.



STINSON L-5 (Now Available)



| | |
|--|-----------------------------------|
| Specs: | True 1/4-Scale, Q.S.A.A. Eligible |
| Wingspan | 102 inches |
| Wing Area | 1780 square inches |
| Length Overall | 72 inches |
| Weight | 14-18 pounds |
| Engine | Quadra Q-35, Zenoah G-38 |
| Plans | \$38.00 |
| Fiberglass Cowling | \$48.00 |
| Formed/Welded L.G. | \$43.00 |
| L.G. strut covers, blisters & dummy exhaust stacks | \$18.00 |
| Construction Photo Pack | \$20.00 |



ROY VAILLANCOURT
18 Oakdale Ave., Farmingville, New York 11738
(516) 732-4715

All prices include shipping in continental USA.
Make checks payable to: Roy Vaillancourt
Send \$1 for catalog

New York residents add sales tax.

BUILD A MODEL OF THE BUMBLE BEE II

—the world's smallest piloted airplane.

Exact-scale set of plans (1 inch = 1 foot) and autographed, color picture of the Bumble Bee II.

Information package included.

\$19.95



Robert H. Starr
938 Concorda Dr.
Tempe, AZ 85282

Bumble Bee Enterprises

For Those Who Want the Very Best
in Appearance and
Performance

Wingspan 92 3/4"
Wt. 19-22 lbs.
Fuse 82"

NEW 1/3 SCALE EXTRA 300

Imported from Germany
Immaculately Hand Crafted

YOUR COST \$1,600.00

Only model to be represented in both the
Tournament of Champions in Las Vegas and the
Scale Masters in Texas - a tribute to its aerobatic
flying capabilities and potential for scale
competition at the highest level.

**Includes all hardware: Wheels - Aluminum
Spinner - Glass Fuse, Cowl & Wheelpants
- Sheeted Wings - Stab - Rudder.**

Most beautiful realistic scale flying machine available
today! Limited production - Each kit numbered.

50% deposit required with order, balance C.O.D. upon
delivery. Availability by reservation only. Video tape
available, send \$10.00 (refundable with purchase of kit).
S&H and C.O.D. extra. Florida residents add 6% sales tax.

MODEL AVIATION TECHNOLOGY

12848 Touchstone Place • Palm Beach Gardens, FL 33418
Phone: (407)626-6955 • FAX: (407)626-1588

FIBERGLASS

(Continued from page 97)

If none of this works, cut part of the fiber-
glass with a razor saw and pry the it off the
mold. When it's off, it can be repaired from
the inside of the mold.

With one of the wingtips shown, prying the
fiberglass off at the tip's trailing edge caused
the two layers of fiberglass to separate. This
allowed the fiberglass to be removed easily,
and the joint was repaired with epoxy, which
was applied inside the tip in the joint area.

The easiest way to sand the outside of a
new part is to put it back on the mold and
sand it there. After that, you might want to put
a thin layer of resin over it to speed up surface
finishing.

Clean the inside of the part with water to
remove the PVA film that will be sticking to
its inside.

ATTACH THE TIP

I used no. 1, flat-head, sheet-metal screws
about 2 inches apart to attach the tip to the
wing skin. For a flush tip-to-wing joint, attach
1/4-inch balsa or 1/32-inch plywood with most
of the material removed from the middle of
the wood, to the outside of the rib. Then the
fiberglass tip can be epoxied to the wood.

SUMMARY

Vacu-bagging is excellent for the limited pro-
duction of any type of fiberglass part, large or
small—even fuselage sides or complete
wings. Parts made in this way will be strong

because they're made of compressed layers of
fiberglass. The simple tooling involved in
vacu-bagging can save quite a bit of time.
You can control a part's weight by using a
predetermined quantity of resin. The method
is ideal for making wingtips, wheel pants and
engine cowl.

The disadvantage of the process is that the
part's surface will be somewhat rough and
will have to be sanded smooth and filled with
a primer. Also, the method doesn't allow you
to make surface details or complicated shapes,
such as a recess for a landing gear door or a
canopy. (You'll have to add that later.)

The next time you need to make fiberglass
parts for your model, try bagging them; it's a
procedure that will serve you well.

Look to Jet Hangar Hobbies for *twice* as much
airplane for your dollar. The JHH F-86F special
package includes a complete kit, K&B 7.5 cc
engine, tuned pipe, Turbax™ I Fan, Rhom Air
Retracts and hardware, all for only \$785.00* - *half*
that of the other leading manufacturer's F-86.
Not only is it easy to afford, but it's also very easy
to build and fly. The F-86F was designed as a
true ducted fan trainer, possessing excellent high
and low speed flight characteristics. It's hard to
stall and easy to land. This kit can be built as a
Navy FJ-2/3 Fury or an Air Force F-86F Sabre.

So if you're doing a little too much spending and
not enough flying, or if you've wanted to move up
to a ducted fan but thought it was too expensive,
then the Jet Hangar Hobbies F-86F special pack-
age is the airplane for you!

*Includes UPS ground, California residents add sales tax.

JET HANGAR HOBBIES, INC.

12130G Carson, Hawaiian Gardens, CA 90716
(310) 429-1244 • FAX (310) 429-6648



Dealer Inquiries Invited.

©1992 JET HANGAR HOBBIES, INC.

FIBERGLASS

*Here's the address of the company mentioned in this article:
K&B Mfg. Inc., 2100 College Dr., Lake Havasu City, AZ 86403. ■

BARON ALPHA

(Continued from page 96)

The flying characteristics of the Alpha II are excellent: hovering maneuvers are very stable, slow pirouettes; nose-in maneuvers are rock-solid; the transition from slow, precise hovering to forward flight is positive and very responsive; vertical acceleration, though unimportant, is very good; and fast-forward flight back to hover is precise and predictable.

CONCLUSION

From the moment you open the box, you'll find

the Baron Alpha II a very enjoyable experience. Kalt has really done a fine job developing it, and everything that goes into it—parts quality, parts fit, ease of assembly, clarity of instructions and flying characteristics—is excellent. Whether you're a novice or an expert pilot who wants a machine that will do it all, the Alpha II can be the one machine that will take you from beginner to expert and anywhere in between.

*Here are the addresses of the companies mentioned in this article:

Horizon Hobby Distributors, Dept. C, 4105 Fieldstone Rd., Champaign, IL 61821.
O.S., distributed by Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61824.
JR, distributed by Horizon Hobby Distributors.
Robert Mfg., P.O. Box 1247, 310 N. 5th St., St. Charles, IL 60174.
Miniature Aircraft USA, 2324 N. Orange Blossom Trail, Orlando, FL 32804. ■



HOBBY SHOP DIRECTORY

Retailers: Make your business grow with new traffic! Now you can advertise your hobby shop in the **Model Airplane News Hobby Shop Directory**. The listing will be published monthly and will be listed according to city and state. You have 3 to 4 lines, approximately 20 words, in which to deliver your sales message, plus space for your store's name, address and telephone number.

HOBBY SHOP DIRECTORY SPACE RATE

- \$179 per year
 - \$97 for six months
 - \$48.50 for three months
 - ALL PAYABLE IN ADVANCE
- Space reservations must be received by the 10th of the third month preceding publication (for example, January 10th for the April issue).

FLORIDA—Winter Springs

- UPS orders shipped daily
- Dealer for Yellow Aircraft
- Send \$3 for Yellow info pack
- Full line of hobby accessories
- Visit our showroom (35 min. from Disney World)

BOB FIORENZE HOBBY CENTER, INC.
 420 W. S.R. 434 (407) 327-6353
 [11/12/1]

ILLINOIS—Chicago

Chicago's largest hobby shop. R/C planes, helicopters, boats and cars. R/C repairs, installations and custom building. Mon.-Fri. 10-9; Sat. 10-6; Sun. 11-4.

STANTON HOBBY SHOP, INC.
 4734 Milwaukee Ave. (312) 283-6446
 [11/12/1]

NEW YORK—Brooklyn

R/C planes, helicopters, boats, cars, rockets and jets. Full line of parts and accessories. *Huge inventory!* If we don't sell it, they don't make it! Bob Violett dealers. Huge heli stock: Hirobo, TSK, X-Cell & Concept (all models) Discount prices everyday!
 Mon./Th./F 10-9; Tues./Wed. 10-7; Sat./Sun. 10-6

THE ULTIMATE HOBBY
 7021 Veterans Ave., (718) 241-8434
 (Off Ave. "U" and E. 70th) [6/93]

NEW YORK—Penfield

Full-service hobby shop
 27 years of R/C experience!
 Airplanes, boats, rockets, pine cars, plastic and wooden models, tools, accessories.
 Daily UPS shipping worldwide—special orders encouraged!
 Dealer for Ace, Hitec, JR—sales and service.
PANCO HOBBIES
 1865 Penfield Rd. (Rt. 441) (716) 383-1320
 [11/12/1]

LATIN AMERICA

BRASIL—Belo Horizonte

Aeromodelos, carros, barcos e helicópteros radio controle.
 Modelos plasticos para montar, partes e concertos
HOBBY 'N WOOD MODELISMO LTDA.
 Av. Silviano Brandao 2100
 Tel: 55-031-463-9944 Fax: 55-031-4615501

NEW JERSEY—New Brunswick

R/C helicopters: Concept, Schluter, parts & accessories
 R/C cars, boats, parts & accessories
 Customer support available
 "A daddy's toy store"
HOVER CENTER PLUS, INC.
 131 French St.
 (908) 937-5828 [8/93]

Send sales message and payment to
**Model Airplane News
 Hobby Shop Directory**,
 251 Danbury Rd., Wilton, CT 06897.
 For more information, call toll-free
 (800) 243-6685
 and ask for Arlene Melko

| STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION | | | | | | | | | | |
|---|---|--|--|------------------------------|---------|--|--|-----------------------|---------|--|
| Required by 49 U.S.C. 1952 | | | | | | | | | | |
| 1. Title of Publication | Model Airplane News | | | 2. Issue Date | 10/1/92 | | | 3. Issue of This Year | 10/1/92 | |
| 4. Number of Issues Published Annually | 12 | | | 5. Annual Subscription Price | \$24.95 | | | | | |
| 6. Owner (Print Name of Owner, Title of Publisher, Editor, and Managing Editor, Office and Street Address, City, State, and Zip) | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 7. Known by the Name of (Print Name of Owner, Title of Publisher, Editor, and Managing Editor, Office and Street Address, City, State, and Zip) | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 8. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 9. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 10. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 11. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 12. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 13. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 14. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 15. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 16. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 17. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 18. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 19. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 20. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 21. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 22. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 23. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 24. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 25. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 26. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 27. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 28. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 29. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 30. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 31. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 32. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 33. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 34. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 35. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 36. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 37. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 38. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 39. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 40. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 41. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 42. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 43. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 44. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 45. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 46. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 47. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 48. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 49. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 50. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 51. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 52. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 53. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 54. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 55. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 56. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 57. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 58. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 59. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 60. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 61. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 62. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 63. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 64. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 65. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 66. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 67. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 68. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 69. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 70. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 71. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 72. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 73. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 74. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 75. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 76. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 77. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 78. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 79. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 80. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 81. Complete Mailing Address | 251 Danbury Road, Wilton, Connecticut, CT 06897 Dr. Louis F. DeFrancesco, 251 Danbury Road, Wilton, CT 06897 Tom Atwood, 251 Danbury Road, Wilton, CT 06897 Managing Editor: Name and Complete Mailing Address | | | | | | | | | |
| 82. Complete Mailing Address | 251 Dan | | | | | | | | | |

CLASSIFIEDS

RATES: non-commercial—25 cents per word. No charge for name and address (no commercial ads of any kind accepted at this rate.); commercial—50¢ per word (applies to retailers, manufacturers, etc.); count all initials, numbers, name and address, city, state, zip code and phone number. **All ads must be paid for in advance.**

To run your ad for more than one month, multiply your payment by the number of months you want it to run. Deadline: the 10th day of the month, e.g., *January 10 for the April issue.* We don't furnish box numbers, and it isn't our policy to send tear sheets. **SEND AD AND PAYMENT TO: CLASSIFIED ADS, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.**

R/C WORLD—ORLANDO, FL, CONDO RENTAL—2 bedroom, furnished. Available weekly or monthly. Low rates, 100 acre flying field with enclosed hangar. Swimming pool, tennis courts on site. Minutes from Disney World and Epcot Center. For information, call Micki at (800) 330-7243 or (407) 260-1252; fax (407) 331-3867; or write to: Page One Management Realty Inc., P.O. Box 4732, Winter Park, FL 32793-4732.

OLD-TIMERS, take a ride back in time to airplane modeling roots with this vintage book—*Gas Models*. A true collector's book from the early editors of *Model Airplane News*, it contains the best of modeling from the '30s and '40s, including great technical information and classic construction articles from the Golden Age period. \$7.95, add \$3 S&H for first item; \$1.50 for each additional item. *Foreign*: (including Canada and Mexico)—*airmail*, add \$7.50 for first item, \$4.00 for each additional item. Payment must be in U.S. funds drawn on a U.S. bank, or by international money order. (Connecticut residents add 6% tax; Canadian residents add 7% tax.) Air Age Mail-Order Service, 251 Danbury Rd., Wilton, CT 06897.

PLANS ENLARGED—Scanning/Plotting Services, CAD/Printer Plotter Software, Free Information. Concept, PO 669E, Poway, CA 92074-0669; (619) 486-2464. [12]

CARBON FIBER—100 ft. 12k tow . . . \$9.95 plus \$2.00 S&H, to Discount Composites, P.O. Box 13, Bountiful, UT 84011-0013. [12/1/2/3]

VACUUM FORMING—Now in its third printing, the most comprehensive book on vacuum forming ever published for the hobbyist. 128 pages of hands-on information show how easy it really is to make your own plastic parts. Includes exclusive information on an easy-to-build 2-stage vacuum system for truly professional results. It's easy! Try it! \$9.95 + \$1.05 postage. Vacuum Form, 2728 Morganhill Dr., Lake Orion, MI 48360; (800) 737-3000. \$1 surcharge for Visa/MC. [12/1]

R/C REPORT MAGAZINE'S ENGINE TESTS BOOK—Over 60 reviews. Many direct comparisons of similar engines. Includes accurate measurements, honest performance ratings, and candid reviewer opinions. Just \$9.95 + \$1.75 S&H. Free sample magazine included! R/C Report, Box 1706-M, Huntsville, AL 35807. [1,2]

WANTED: Model engines and race cars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [1-5/93]

WANTED: your old proportional radios; interested in pre-1980, American made; C&S, Deans, Klinetronics Spar and others. Older is better. Ron Gwara, 21 Circle Dr., Waverly, NY 14892; (607) 565-7486. [3/93]

WANTED: Old, unbuilt, plastic model kits. Planes, military, figures, cars, promo. Aircraft or missile desk models. Send list, price. Models, Box 863, Wyandotte, MI 48192. [9/93]

ENGINES: Ignition, glow, diesel. New, used, collectors, runners. Sell, trade, buy. Send \$2 for large list. Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555; (619) 375-5537. [12]

ANTIQUE IGNITION AND GLOW PARTS CATALOGUE: 100 pages—timers, needle valves, original cylinder heads, point sets, drive washers, stacks, spark plugs, plans. Engines: Atwoods, Baby Cyclones, McCoys, Hornets, others. \$8 postpaid, U.S.; \$20 foreign. Chris Rossbach, R.D. 1 Queensboro Manor, Box 390, Gloversville, NY 12078. [1/2]

MAGAZINE BACK ISSUES—Flying Aces, MAN, Air Trails, 1930s and '40s. FM, RCM and more. Send SASE for list to: Carolyn Gierke, 1276 Ransom Rd., Lancaster, NY 14086. [1/2]

1930s to 1950s MODEL AIRPLANE MAGAZINES: 1930s aviation pulps—complete and good condition; \$1 for list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada, M5M 1W3. [12-4/93]

SCALE MODEL RESEARCH: Aircraft documentation. World's largest. Over 3,300 different Foto-Paaks and 20,000+ drawings. Catalogue—\$4. 2334 Ticonderoga Way, Costa Mesa, CA 92626. [6/93]

SCALE DOCUMENTATION, plans enlarging; 140 super-scale, sport and giant R/C construction plans, three-views, cutaway drawings. Over 100,000 documentation photos in stock; 120-page catalogue, \$5 (\$10 overseas). Jim Pepino's Scale Planes and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; (919) 292-5239. Visa/Mastercard. [1/3/5]

GIANT-SCALE PLANS by Hostetler. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667. [10/93]

INTERNATIONAL AIRCRAFT RESEARCH Need documentation? Include name of aircraft for availability of documentation with \$3 for three-view and photo catalogue. 1447 Helm Court, Mississauga, Ontario, Canada L5J 3G3. [1]

BUTTON-HEAD SHEET-METAL SCREWS—2x2 1/2—\$4.90 for 100; 4-40x3/4 alloy socket caps—\$4.75 for 100. New, lower prices on metric socket caps. Free catalogue. Contact Micro Fasteners, 110 Hillcrest Rd., Flemington, NJ 08822; (908) 806-4050; fax (908) 788-2607.

P/C—THE EASY WAY to simulate metal panels; \$1 gets information and sample. Clarke Smiley, 23 Riverbend Rd., Newmarket, NH 03857. [6/93]

CONTROL-LINE AND R/C kits cut on per-order basis. Send SASE to Repli-Kit, P.O. Box 1412, Inverness, FL 32651-1412. [12/1]

WANTED: model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; (918) 245-3649. [6/93]

HELICOPTER SCHOOL—5 days of hands-on instruction with X-Cell helicopters and Futaba computer radios. Small classes tailored to your individual needs. Beginner to expert. Includes all meals and lodging. Over 225 satisfied students and 7,500 flights logged. Located on a 67-acre airport used exclusively for R/C training; owned and operated by Ernie Huber, five-time National Helicopter Champion and helicopter designer. Send for free information and class schedule now! R/C Flight Training Center, P.O. Box 727, Crescent City, FL 32112-0727, or call 1-800-452-1677, outside USA (904)-6984275 or fax (904) 698-4724. [12/3]

FREE BULLETIN BOARD: new electronic bulletin board for R/C modeling enthusiasts; 1200/2400 baud support. (315) 652-5641. [1/93]

VIDEO: Top Gun '92 —"Flying with The Best." Greatest R/C video ever produced. Multi-camera coverage. Spectacular crash and slow-motion footage. Much more! \$29.95 + \$3.25 shipping. Call (800) 972-4847. Telstar Video Productions, Inc., 114-3 Semoran Blvd., Winter Park, FL 32792. [1/2]

TALK IS CHEAP!! You call, we send a vinyl graphic and our catalogue, FREE! Silicon Valley R/C Technologies—(800) 822-1500. [1/2]

U-CAN STOP SMOKING: Powerful 3-part program: two booklets and cassette tape. Guaranteed results! Send \$14.95 to Box 10100, Bradenton, FL 34282. (AMA member.) [1,2]

SECRET SOURCE: Ready-to-fly electric-powered glider with radio installed. Unbelievable performance at crazy, low price. I bought three. Source and details \$3. Charles Rawnsley, 56 Florida St., Lowell MA 01852. [1,2]

SELL: old kits, gas, rubber, solid; engines, glow, used, new, original instruction sheets, accessories, parts; SASE for list. R.E. Jordan, P.O. Box 331045, Ft. Worth, TX 76163. [12]

QUINTE '92 FAN-JET RALLY VIDEO: a professionally produced videotape of Canada's foremost annual fan-jet rally, featuring Bob Fiorenze's test-flight of Yellow Aircraft's F117 Stealth fighter and a subsequent flight of this unique aircraft. Other highlights are interviews with Bob Fiorenze on flying the Stealth and the F14 swing-wing Tomcat; also Martin Lefebvre on the design and construction of his superb F18. Runs 93 minutes. Still available: Quinte '90 Fan-Jet Rally and the 1990 Flying Dutchmen Scale Rally videos. Send \$22.95 (Cdn.) plus \$5 S&H (Ontario, Canada residents add 8% PST) to Arnan Video Productions, 6 Manor Crescent, Trenton, Ontario, Canada K8V 3Z7; (613) 392-2366. [1,2]

FLY REAL PLANES! For information on obtaining your pilot's license, send \$7 to H. Enterprises, Dept-MAN, P.O. Box 598, Antioch, TN 37011-0598. [1,2,3]

FOR SALE: Vintage Control-line scale P-51 kit. Jetco Models, 31-inch-span. Excellent condition. \$85. Call J. Grasso (908) 638-6902. [1]

JET-ENGINE SALE: pulse jets, Jet-X, Turbonique. Monthly newsletter—\$12/year (\$15 international). Catalogue—\$5. Doylejet, P.O. Box 60311-A, Houston, TX 77205. [1]

NEW FLIGHT-BOX PLANS! Plans for two, unique flight boxes, plus compact fold-up support table. Easy to make! Convertible model has top slide-out tote. Compact model holds 1-gallon fuel jugs! Complete plan and instruction set—only \$10, postage paid. G.M. Steinicke, 7805 SVL Box, Victorville, CA 92392. [1,2]

EXPERIMENTAL ROCKETRY—Missiles, motors, launchers: \$3. Northstar-A3, 813 Cherry Ave., Albany, GA 31701. [1]

WANTED: Built or partially built Ercoupees, Mooney M-10 Cadets, or Cessna 150, 152, 172, 182. Glen Mills, P.O. Box 3393, Mission Viejo, CA 92690; (714) 768-0585. [1-10/93]

WANTED: Original kit form, circa 1968-1970, "Schoolmaster" by Top Flight. Barbara Blythe, 484-B Washington St., Suite 341, Monterey, CA 93940; (408) 372-7586. [1-6/93]

WANTED: Original kit form, circa 1960-1963, Eindecker model, free flight or R/C. Barbara Blythe, 484-B Washington St., Suite 341, Monterey, CA 93940; (408) 372-7586. [1-6/93]

BATTERY-BACKUP SYSTEM: Build your own. Simple, inexpensive, reliable. Plans—\$1 and SASE. D. McIntire, 1027-3 Chestnut, Wainwright, AK 99703. [1,2]

New WATER JET CUT CARBON FIBER STRIPS

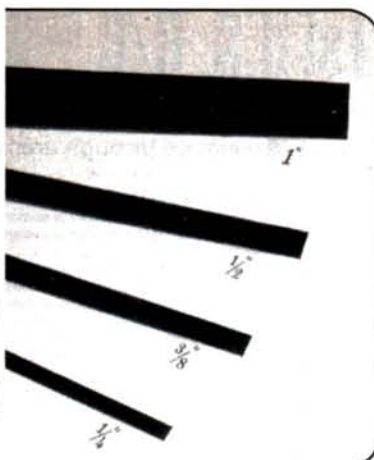
- Latest Technology
- Smooth Edges
- Precision Cut Strips
- Bondable Surfaces
- No Sanding Necessary
- Great For Spar Caps
- Foam Wing Reinforcement
- Lowest Prices

CL1 (.007" Thick) 1/4"x48" (2/pkg) \$3.50 3/8"x48" (2/pkg) \$4.25
 CL2 (.014" Thick) 1/4"x48" (2/pkg) \$4.50 3/8"x48" (2/pkg) \$6.00
 CL3 (.022" Thick) 1/4"x48" (2/pkg) \$5.50 3/8"x48" (2/pkg) \$8.00
 CL4 (.030" Thick) 1/4"x48" (2/pkg) \$6.50 3/8"x48" (2/pkg) \$10.00

Send SASE for information on additional sizes and products.
 Add \$5.00 for shipping and handling. Calif. residents add
 7.75% tax. Overseas orders add 15%. Order C.O.D., MC/
 VISA or send check or money order to:

Aerospace Composite Products
The source for lightweight materials

P.O. Box 16621, Irvine, CA 92714 (714) 250-1107 Fax (714) 250-0307



TIRED OF DRAGGING YOUR WING TIPS ON THE GROUND..
 FLY THE F-100 SUPER SABER FROM

UET

DUCTS FOR VIOJETT OR DYNAMAX
 PLEASE SPECIFY.
 A VERY COMPLETE KIT.

F100.....\$550 + S&H
 VIDEO TAPE MANUAL \$20
 DEMO TAPE\$10
 PITOT POWER.....\$8
 OFFSET DOOR HINGES 6 FOR \$8.
 CALL FOR QUANTITY PRICES.

USHER ENTERPRISES INC.
 1017 SE FRONTAGE RD BOX 511
 NORTH PLAINS OR. 97133
 503-647 0015

AIRWAVES

(Continued from page 10)

match your radio, or perhaps you can make up an adapter plug.

Hobby Lobby (advertised elsewhere in this issue) imports Simprop products and would be a good place to get more information on the Simprop line. Good luck.

GY

TEXAN TWIST

I'm new to R/C aircraft and recently purchased my first copy of *Model Airplane News*. I enjoyed the magazine immensely! I do have one question concerning the article about the Warbird Festival (November '92). The pictures and write-up refer to the AT-6 Texan aircraft. I was under the impression that the Navy-issue version was designated the SNJ and the Canadian version, the "Harvard." Was there any difference between them? Care to comment?

RICH KOSIER
 New Milford, CT

Rich, all three—the AT-6, the SNJ and the Harvard—are basically the same airframe.

The AT-6 and SNJ versions were the first aircraft to have standardized parts for use by both the U.S. Army and Navy. On some Navy aircraft, the landing gear was reinforced and a tail hook and a tail-wheel guard were installed for carrier landings. The Harvard II and III versions were exported to England, Canada and other Allied countries. These versions had extended exhaust pipes for improved cockpit heating systems. A large heat muff that was added to the extension greatly increased the amount of heat that was forced into the cockpit area.

A less-known variant of the airframe was the single-cockpit, razor-back fighter called the P-64 or the NA-50. It was armed with two fuselage-mounted .30-caliber machine guns and two 20mm cannons (one in each wing). This aircraft was sold to Peru during the '40s. So take your pick, if you want a Texan in your hangar you have a lot of versions to choose from.

GY

AT LAST! Z-BEST ENGINE CLEANER



An Effective High Tech Engine Cleaner
 For R/C Engines. Removes
 Burned-on Fuel Residue and
 Encrusted Carbon Build-up From
 Any Bare Metal Engine, Outside and
 Inside.

Z-BEST Cleans Mufflers, Tuned
 Pipes and Headers *Without*
 Scrubbing, and It Won't
 Harm or Discolor The Metal. Four
 Ounces Will Clean 10-15 Engines.
 Clean Engines Run, Cooler and Last
 Longer!

\$6.95
 \$2.00 S & H + CA 8.25% tax
 send check or money
 order or ask your local
 dealer

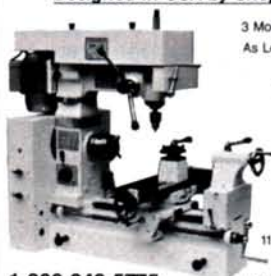
Dist. By
AIRBORNE HOBBIES
 3764 30th. St. San Diego, CA 92104
 1-800-382-0505

M/C VISA

SHOP-TASK

MILL • LATHE • DRILL

The Original Home Machine Shop
 Designed in USA by Shoptask



3 Models to Choose
 As Low As **\$995.00**

3 Axis Power
 Feed Available

12 Month
 Warranty

100% Parts
 Supply

All Tooling
 Available

17" Swing
 11 x 18 Mill Table

1-800-343-5775

FREE CATALOGUE

DEMAND THE BEST

SHOPTASK P.O. BOX 7531-TACOMA, WA 98407
 SINCE 1981

If you're GONNA GET WITH THE PROGRAM, you GOTTA HAVE A plan!

OUR DESIGNS ARE MODELER-PROVEN SPORT FLYERS AS WELL AS CONTEST WINNERS



FLIGHT PHOTOS OF MODELS

Illustrated Catalog \$2.00,
 sent 'no charge' with plans order

PRICES INCLUDE U.P.S. SHIPPING CHARGES
 Fiberglass Components and Canopies Available

| | | |
|----------------------|------|---------|
| B-25 Mitchell | 101" | \$38.00 |
| Ju-87B Stuka | 100" | 32.00 |
| DC-3/C-47 | 140" | 42.00 |
| F4U Corsair | 93" | 32.00 |
| PT-17 Stearman | 77" | 27.00 |
| P-40 Warhawk | 94" | 32.00 |
| AT-6/SNJ Texan | 101" | 32.00 |
| F8F Bearcat | 86" | 32.00 |
| A6M5 Zero | 91" | 32.00 |
| Fokker Dr.1 Triplane | 63" | 27.00 |
| Mew Gull | 100" | 38.00 |
| Taube (semi-scale) | 88" | 25.00 |
| Beech D-18/C-45 | 114" | 40.00 |
| P-51D Mustang | 100" | 32.00 |
| P-47 Thunderbolt | 72" | 25.00 |
| F9F Panther | 72" | 34.00 |

NICK ZIROLI

29 EDGAR DRIVE, SMITHTOWN, N Y 11787. ph. 516.234.5038

LOVE AT FIRST FLIGHT



The easy-to-fly ParaPlane Sport comes 99% assembled, and it includes a training video, so you'll be airborne in about 30 minutes. Order the complete kit for just \$395 and begin your love affair with the ParaPlane today.

CALL FOR A FREE VIDEO*

**1 800-237-8400 EXT.109
PARAPLANE SPORT**



*Plus \$3 s/h. VISA/MC welcome. Dealer inquiries invited. Ask about the basic kit for only \$229.95.

WHAT EVER HAPPENED TO CAPT. PSYCHO?

Many of you have asked about the disappearance of Capt. Psycho. Well, now we can tell you that he has returned from a secret mission for Model/Tronics!!! His first question was, "how are the War Emergency Power motors selling?" We were able to tell him that the WORD IS OUT and electric flyers are snapping up motors as fast as we can build them. Pilots have found out that if done properly, a War Motor in a trim light weight aircraft can eat some "Glo-powered" models Lunch!!!! Through the Capt's leadership, the engineers and designers have been able to work miracles and there are more to come. How about the War Emergency Power PLUS motor? It is being tested NOW. If you have trouble believing this advertisement, then we suggest you order the 1 1/2 hour long VIDEO of our products. You will see mock combat, all of our models and the Supermarine Spitfire and P-39 Airacobra that are coming in the Spring. You will get a chance to see the P-47 flying on 8 cells and hear the unbelievable "moan" it makes as it streaks across the sky with its armature spinning at 50,000 RPM. The secret mission? More on that at a later date. Stay tuned!! and send \$2.00 for your catalog.



Model/Tronics, Inc.
6500 6th Ave. N.W.
Seattle, WA 98117
1-206-782-7458



**YOUR ONLY SOURCE FOR REPLACEMENT
HELICOPTER CANOPIES
AND UNBREAKABLE
UPGRADE PARTS**



201-744-4962

For Inquiries and Ordering Information

A D V E R T I S E R I N D E X

| | | | | | | | |
|------------------------------------|---------|-------------------------------------|-----------|---------------------------------|-----------|---------------------------------|---------|
| Ace R/C..... | 59 | Eldon J. Lind Company..... | 127 | Major Decals..... | 80 | Sky Aviation..... | 126 |
| Acru Star..... | 22 | Electric R/C Corp. | 138 | M.A.N. Buyers' Mart..... | 115-124 | Slimline..... | 43 |
| Aero Classics..... | 135 | Ernst Mfg..... | 135 | Marc's Modelers Tools..... | 135 | Smithy..... | 90 |
| Aerocraft..... | 80 | 1st U.S. Flight School..... | 135 | MI Air..... | 22 | Sport Flyers Association..... | 48,49 |
| Aerospace Composite Products..... | 136 | Fox Manufacturing..... | 99 | Midwest Products..... | 13 | SR Batteries..... | 58 |
| Aerotrend..... | 90 | Frank's Hobby House..... | 45 | Miniature Aircraft..... | 38 | Stream, Inc..... | 99 |
| Air & Space Smithsonian..... | 109 | Futaba Industries..... | C3 | Model Aviation Technology..... | 130 | Super Tigre..... | 129 |
| Airdrome..... | 109 | Ghosts..... | 135 | Model Products Corp..... | 88 | Tatone..... | 57 |
| Airtronics, Inc..... | 4 | Global Hobby..... | 89 | Model/Tronics..... | 135,138 | Technopower II, Inc..... | 97 |
| Altech Marketing..... | C2,54 | Great Circle Hobbies..... | 99 | National Balsa..... | 113 | Teleflite Corporation..... | 113 |
| America's Hobby Center..... | 132-133 | Great Planes..... | C4 | Nick Zirolli..... | 136 | Telestar Video Productions..... | 113 |
| B&P Associates..... | 82 | GRC Publications..... | 80 | Omni Models..... | 92 | The Airplane Factory..... | 90 |
| Bob Smith Industries..... | 3 | Hel-X..... | 138 | O.S. Engines..... | 67 | TNR..... | 8 |
| Bob Violett..... | 34 | Hobbico..... | 47 | Pacer Technology..... | 23 | Top Flite..... | 91 |
| Boca Bearing..... | 131 | Hobbico/M.A.N. R/C Sweepstakes..... | 26-27 | Palmer Plans..... | 43 | Top Gun Aircraft..... | 137 |
| Bridi Aircraft..... | 102 | Hobby Lobby International..... | 50-51 | Pica Enterprises, Inc..... | 101 | Tower Hobbies..... | 103-105 |
| Bruckner Hobbies..... | 33 | Hobby Shack..... | 60-61 | Pocket R.C..... | 97 | U.S. Aircore..... | 21,36 |
| Bumble Bee..... | 129 | Hobby Shop Directory..... | 131 | Proctor Enterprises..... | 34,80,127 | Usher Enterprises..... | 136 |
| Byron Originals, Inc..... | 74 | IMS Model Sport & Hobby Show..... | 125 | Propwash Video Productions..... | 82 | Vacuum Form..... | 127 |
| Carl Goldberg Models..... | 72-73 | Indy R/C..... | 17 | Radar Sales..... | 113 | Vaill Aviation..... | 129 |
| Carlson Engine Imports..... | 125 | J&K Products..... | 46 | R/C Jobs..... | 127 | Varsane Products..... | 101 |
| Charlie's R/C Goodies..... | 137 | JD Model Products..... | 82 | R/C Launcher & Pit Crew..... | 137 | Video Specialties..... | 135 |
| Classified Directory..... | 134 | Jet Hangar Hobbies..... | 130 | R/C USA..... | 58 | Watkins Aviation, Inc..... | 113 |
| Cleveland Model and Supply Co..... | 34 | JR Remote Control..... | 14 | Retailer..... | 137 | Wells Cargo, Inc..... | 57 |
| Coverite..... | 90 | K&B Manufacturing, Inc..... | 90 | Robart Manufacturing..... | 111 | Williams Bros..... | 43 |
| Davis Model Products..... | 9 | K&S Engineering..... | 43 | Robbe Model Sport..... | 82 | Windsor Propellor Co..... | 10 |
| Double M Electronics..... | 7 | Kress Jets, Inc..... | 101 | Sermos R/C Snap Connectors..... | 125 | WRAM Show..... | 94 |
| Du-Bro Products..... | 7,9 | Kyosho..... | 35 | Sherline Products..... | 109 | Young Engineering..... | 101 |
| Dynafite..... | 88 | L&R Aircraft..... | 85 | Shields Aviation..... | 135 | Z-Best..... | 136 |
| Dynamic Modelling..... | 127 | Lanier RC..... | 57,97,113 | Shop Task..... | 136 | | |
| Eagle Miniatures..... | 109 | Level Ten Products..... | 109 | Sig Manufacturing..... | 52 | | |